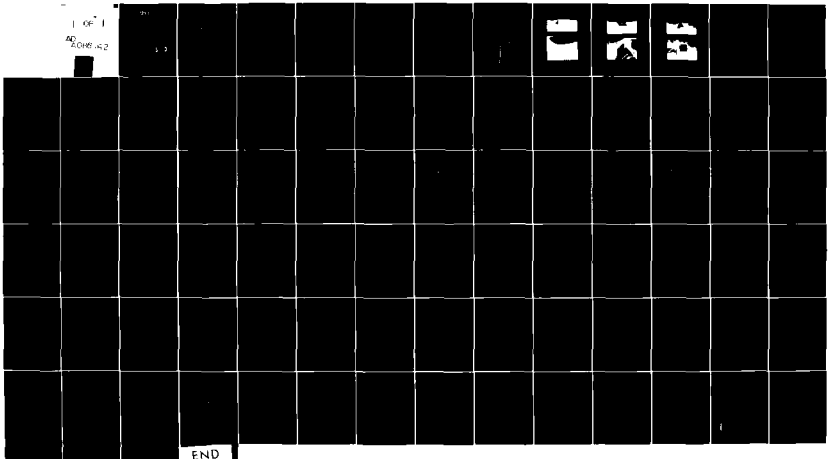
AD-A086 182 NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/13
NATIONAL DAM SAFETY PROGRAM. LAKE DE FOREST DAM (INVENTORY NUMB--ETC(U)
JUN 78 C H BENN DACW51-79-C-0001

UNCLASSIFIED NL



END
DATE FILMED
8-80
DTIC

LEVEL II

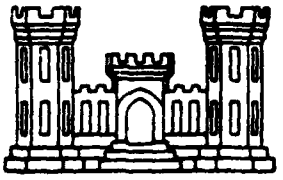
(10)

HACKENSACK RIVER BASIN

ROCKLAND COUNTY, NEW YORK

INVENTORY NO. 95

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAKE DE FOREST DAM



Prepared by: NEW YORK DISTRICT CORPS OF ENGINEERS

For: THE STATE OF NEW YORK

Date: 14 JANUARY 1978

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A086 782
4. TITLE (and Subtitle) Phase I Inspection Report Lake De Forest Dam Hackensack River Basin, Rockland County, NY Inventory No. NY 95	5. TYPE OF REPORT & PERIOD COVERED Phase I Inspection Report National Dam Safety Program
7. AUTHOR(s) (11) Col. Clark H. Pratt	8. CONTRACT OR GRANT NUMBER(s) (15) DACW51-79-C-0031
9. PERFORMING ORGANIZATION NAME AND ADDRESS Department of the Army 26 Federal Plaza/New York District, C of E New York, New York 10278	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Department of the Army 26 Federal Plaza/New York District, C of E New York, NY 10278 (11) 21 Jul 79	12. REPORT DATE 1979 13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Department of the Army 26 Federal Plaza/New York District, C of E New York, NY 10278	15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

(16) National Dam Safety Program. Lake De Forest Dam (Inventory Number NY-95), Hackensack River Basin, Rockland County, New York. Phase I Inspection Report.

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Lake DeForest Dam
Rockland County
West Nyack

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

The Lake de Forest Dam is well maintained and operated. Nothing was determined to render the dam unsafe. No remedial measures are necessary. However, to monitor actual behavior, instrumentation in the form of weirs and piezometers should be installed within a reasonable period of time and read and evaluated periodically under the supervision of a licensed professional engineer.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED 393940

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

HACKENSACK RIVER BASIN - LAKE DE FOREST DAM

INVENTORY NO. 95

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

LIST OF DRAWINGS

LIST OF APPENDICIES

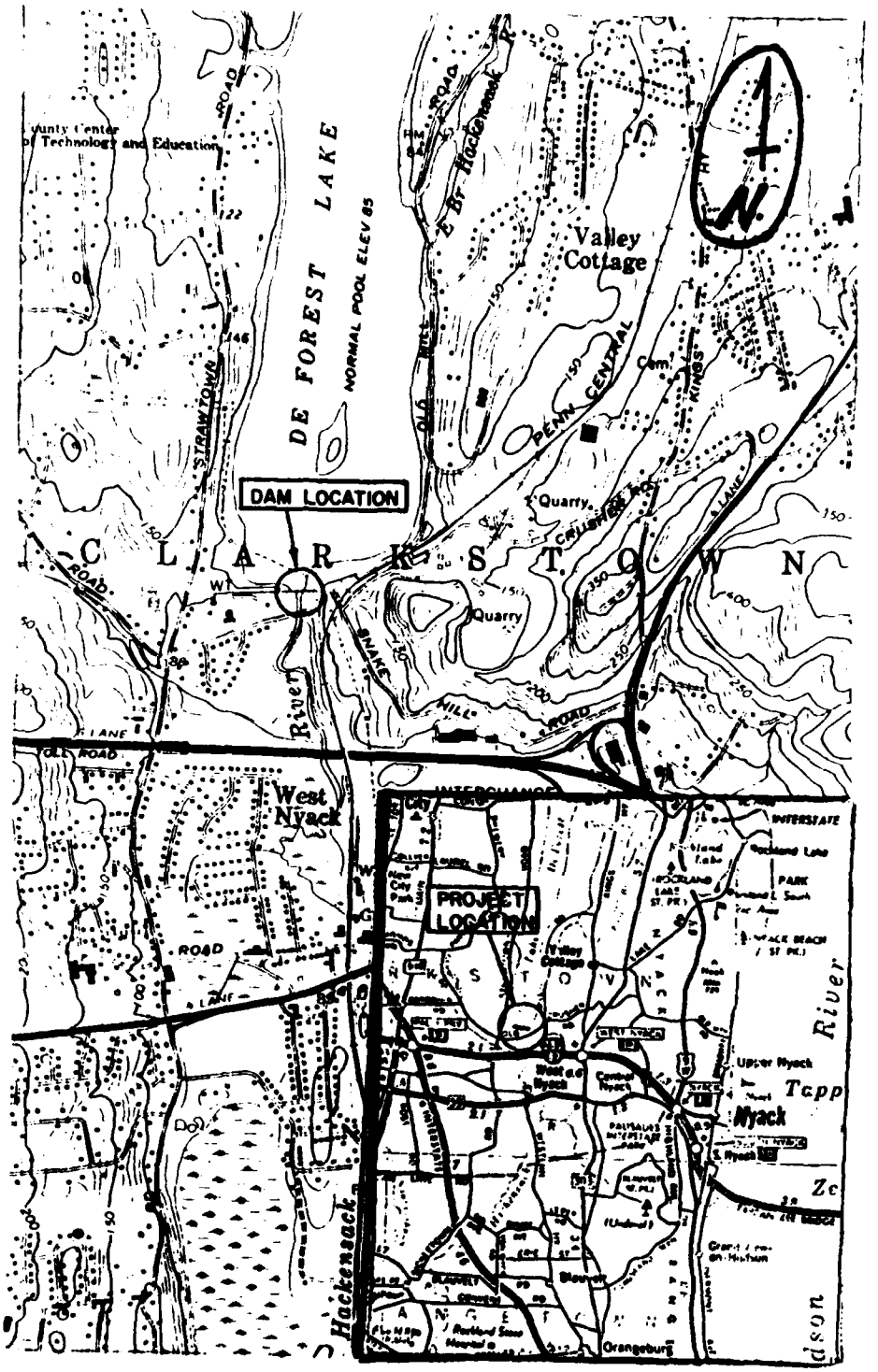
PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	LAKE DE FOREST DAM
State Located:	NEW YORK STATE
County Located:	ROCKLAND COUNTY
Stream:	HACKENSACK RIVER
Date of Inspection:	14 DECEMBER 1977

ASSESSMENT

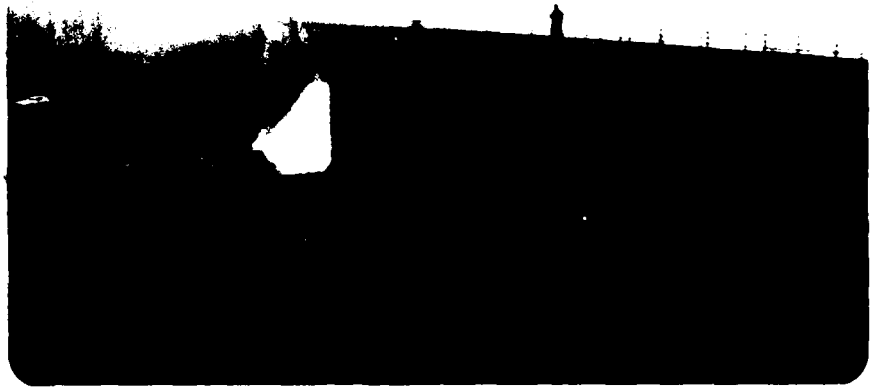
The Lake de Forest Dam is well maintained and operated. Nothing was determined to render the dam unsafe. No remedial measures are necessary. However, to monitor actual behavior, instrumentation in the form of weirs and piezometers should be installed within a reasonable period of time and read and evaluated periodically under the supervision of a licensed professional engineer.

Approved by: _____
CLARK H. BENN
Colonel, Corps of Engineers
District Engineeer



TOPOGRAPHIC MAP
LAKE de FOREST DAM
AND RESERVOIR

PHOTO 1

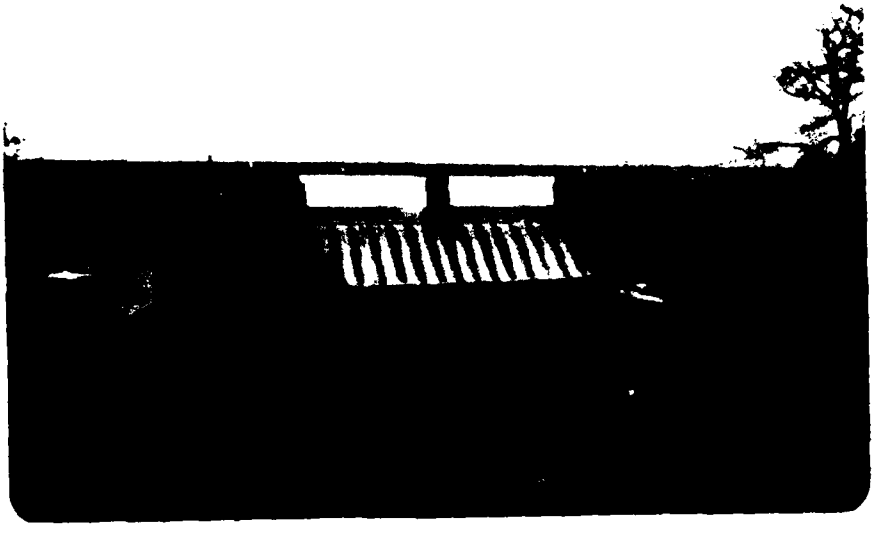


LOOKING ALONG DAM ALIGNMENT
(FROM EAST TO WEST)

PHOTO 2

DOWNSTREAM TOE OF SLOPE
(LOOKING WEST)

PHOTO 3



OVERFLOW SPILLWAY AND ABUTMENTS

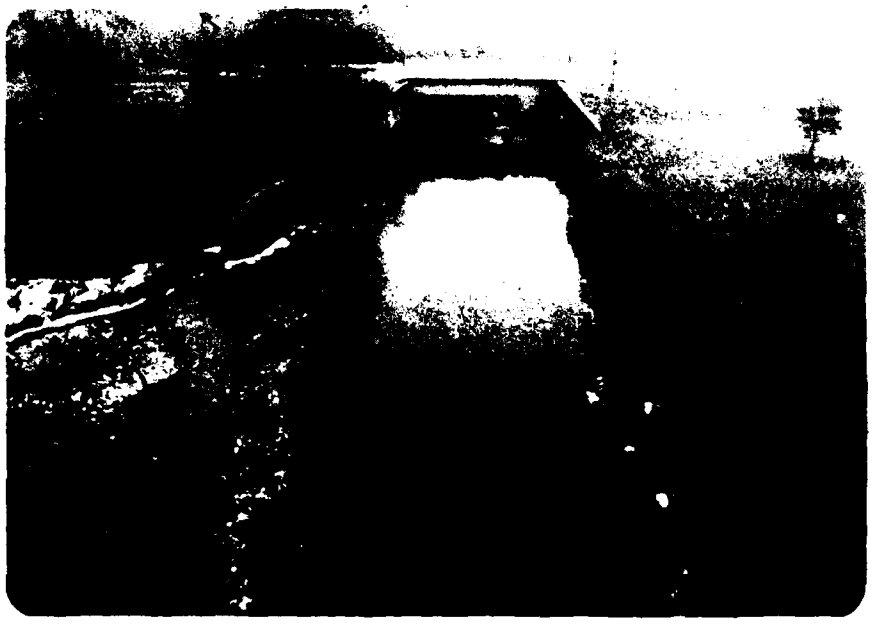
PHOTO 4

DOWNSTREAM SLOPE OF DAM
(LOOKING WEST)

PHOTO 5

CREST OF DAM (LOOKING WEST)
NOTE GROWTH ON UPSTREAM FACE

PHOTO 6



OUTLET CHANNEL LOOKING DOWNSTREAM
TOWARD RELOCATED OLD MILL ROAD BRIDGE

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAKE DE FOREST DAM I.D. NO. 95

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL:

a. Authority. National Dam Inspection Act, Public Law 92-367, 8 August 1972.

b. Purpose of Inspection. The purpose of this inspection and report is to investigate and evaluate the existing conditions of subject dam in order to: (1) identify deficiencies and hazardous conditions; (2) determine if they constitute hazards to human life or property; (3) and notify the State of New York of these results along with recommendations for remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT:

a. The Lake de Forest Dam, designated hazard category 1 as per the "National Inventory of Dams", is owned by the Spring Valley Water Works and Supply Company, with main offices located in West Nyack, New York. Constructed in 1956, it is located along the Hackensack River within the Hackensack Basin, approximately on-half mile north of West Nyack in Rockland County, New York. It is a 40-foot high (max.) compacted homogeneous earth fill section dam approximately 1330 feet long, with a uniform embankment slope and combination manhole and toe drain system to collect subsurface seepage on the downstream toe-of-slope. The dam empounds the Hackensack River for distribution to residents of the Town of Clarkstown, Orangetown and Haverstraw and portions of the Towns of Ramapo and Stony Point in Rockland County, New York. The outlet works consist of two Howell-Bunger valves, 24-inches and 12-inches in diameter, located adjacent to the west side of the spillway. Water is accepted on the rip-rap upstream face of the dam through a semi-circular intake via a 60-inch diameter pipe and discharging downstream of the spillway. A valve control room and chamber facilitates regulation of the outflow. Adjacent to the outlet valve system is a 100-foot wide ogee-section concrete spillway regulated by two 5-foot high in its raised position, 50-foot long bascule gates and associated gate control rooms allowing for overfow into the unpaved downstream channel. Diversion to the treatment plant (not shown on plans and constructed subsequently to this project) is accomplished through a 24-inch diameter conduit. The downstream slope of the dam is grassed. A 20-foot wide run-of-bank gravel service road extends along the top of the dam. The relocation of Old Mill Road and construction of a steel service bridge spanning the east and west abutments extending over the spillway was also included in this project.

b. Normal Operational Procedure - During normal operations, the two bascule gates are in the raised position (elevation 85 feet) which will maintain a full normal pool elevation which is desirable for the purpose of water supply. Above elevation 85 feet, water flows over the spillway. The hydraulic pressure from the water surcharge above 85 feet causes the bascule gates to lower to elevation 80 feet. This procedure goes into effect automatically. A hydraulically controlled system is provided in the control structures to lower or

raise the bascule gates at will. The manually-operated 12-inch outlet and the electrically-operated 24-inch outlet are generally kept closed during normal operation. The dam, bascule gate Control Area, and intake structure are inspected hourly as part of the normal patrolling and operating procedures. A continuous reservoir stage record is kept and read every hour. The dam is inspected annually by the Chief Engineer.

1.3 PERTINENT DATA:

a. Drainage Area - 26.6 sq. miles

b. Discharge at Damsite -

Maximum known flood at damsite	80-85	MGD
Warm water outlet	88	CFS
Div. tunnel low pool outlet	139	CFS
Diversion tunnel outlet	591	CFS
Gated spillway at elevation 85 feet	3,578	CFS
Gated spillway at max. pool elevation	10,118	CFS
Ungated spillway at max. pool	10,118	CFS
Total spillway at max. pool	10,118	CFS

c. Elevations (above MSL) -

Top of dam	100	FT
Max. pool	90	FT
Surcharge	10	FT
Full flood control pool	85	FT
Recreation pool	85	FT
Spillway crest (bascule gates Up)	85	FT
Spillway crest (bascule gates Down)	80	FT
Upstream portal invert div. tunnel	57	FT
Downstream portal invert div. tunnel	58	FT
Streambed at centerline of dam	51	FT
Maximum tailwater	64.5	FT

d. Reservoir -

Length of maximum pool	5.02	MILES
Length of recreation pool	4.39	MILES
Length of flood control pool	4.39	MILES

e. Storage -

Recreation pool	17,250	ACRE FEET
Flood control pool	17,250	ACRE FEET
Design surcharge	19,110	ACRE FEET
Top of dam	36,362	ACRE FEET

f. Reservoir Surface -

Top of dam	1,675	ACRES
Maximum pool	1,130	ACRES
Flood control pool	1,025	ACRES
Recreation pool	1,025	ACRES
Spillway crest	900	ACRES

g. Dam -

Type:	Homogeneous compacted earth fill (glacial till)
Length:	1,330 feet
Height:	40 feet (maximum)
Top width:	20 feet
Side Slopes:	2½ H on 1V (upstream and downstream)
Zoning:	None
Impervious core:	None
Grout Curtain:	No grout used on project.

h. Diversion and Regulating Tunnel -

Regulating Facilities - A portion of the outflow from De Forest Lake is diverted through a 24-inch diameter conduit at elevation 59.75 feet to the Spring Valley Treatment Plant where it is treated and dispensed to local consumers.

i. Spillway -

Type:	Ogee
Length of weir:	100 feet
Crest elevation (gates down):	80 feet
Crest elevation (gates up):	85 feet

Gates: Two 50 feet hydraulically-operated bascule gates. Each gate is 5 feet high, raising spillway crest to 85 feet (above msl).

Downstream Channel: Reinforced concrete spillway discharges into small stilling basin.

j. Regulating Outlets -

There are three sluice gates in the intake structure, each 36 inch x 36 inch in size, at elevation 60.00, 67.50, and 75.00 feet msl respectively. These are used to control the total flow from the dam into the treatment plant and thence into the Hackensack River. The Howell-Bunger valves work similarly to control the outflow from the dam. The 24-inch Howell-Bunger valve is electrically operated by a manual switch. The 12-inch Howell-Bunger valve is manually operated. The bascule gates allow the storage of 5 feet of additional water. These are automically operated by an air operated hydraulic cylinder energized by a float mechanism responding to the elevation of the water in the reservoir pool.

SECTION 2: ENGINEERING DATA

2.1 DESIGN:

The design of the dam and related structure was made by the engineering firm of Buck, Seifert, and Jost of Englewood Cliffs, New Jersey. Pertinent sections of the following have been utilized in this report and copies retained in the New York District's file:

a. Invitation and Instructions to Bidders - Specifications, Proposal, Contract, and Bond for the Construction of Lake de Forest Dam, August 1954.

b. Report on a Geophysical Survey at the Proposed Northern Reservoir Dam Site of the Spring Valley Water Works and Supply Company December 1950 - January 1951.

c. Engineering field book utilized during construction (sheets 32 through 51) providing steel sheet piling cut-off information.

d. Spillway design computations for Lake de Forest Dam.

e. Structural stability and analysis computations for overflow section. No as-built drawings exist for this project, however, contract drawings were utilized for analysis purposes. Portions of the design analysis have been inspected and are available for further review at the offices of Buck, Seifert, and Jost.

SECTION 3: VISUAL INSPECTION

3.1 Findings:

a. Embankment. The dam which is approximately twenty two (22) years old showed no signs of sloughing or erosion of the embankment slopes. Dam embankment/abutment interfaces showed no visible signs of distress and/or movement. Neither the vertical nor horizontal alignment of the crest was altered with no unusual movement or cracks observed including riprap failures or dislocations. Visual inspection of the toe drain pipe collection system, which collects toe drainage prior to being conveyed to the junction chamber for discharge out through the west training wall, was made through the manhole at Sta. 11+13. Observation of discharge at the manhole, reflective of toe drainage only, shoed only slight flow. On the upstream riprapped face, brush and small trees were growing uncontrolled over the area.

b. Concrete. Visual inspection of the concrete structures included checking for surface cracks, structural cracking, vertical and horizontal alignment, monolith and construction joints, the spillway, the valve control room, chamber facilities, the intake tower, and associated concrete walls and appurtenant structures. In general, the concrete appeared to be in excellent condition. The design of the abutment section calls for a joint drain at each vertical joint discharging into a washed gravel and crushed stone rock drain which in turn discharges through a 12-inch pipe to a weir chamber. Joint drainage through the spillway joint system likewise flows into this weir. Visual observation indicated slight seepage through this sytem into the weir chamber.

c. Downstream Channel. No visual evidence of excessive scour was observed. Minor brush exists on the channel slopes.

d. Spillway/Gates/Valves. The heaters in the spillway pier and the upstream spillway approach were functioning and preventing ice floes from blocking the spillway. The bascule gates were raised (elevation 85 feet). One gate was temporarily locked for the purpose of maintenance. The Howell-Bunger valves exhibited a very slight leak leading to a negligible discharge from the outlets. The 24-inch outlet was opened showing a clear discharge without any visible sign of sedimentation or debris. Approximately three inches of water was discharging over the spillway. The flow was smooth and uniform.

e. Reservoir Area. At the time of the inspection, the reservoir pool elevation was at 85.2 feet (msl). Although small ice floes were spotted on the reservoir surface, the spillway area was clear of ice and any other obstructions.

3.2 Evaluation:

Visual observation revealed that the dam and attendant structures are structurally sound and no immediate actions to remedy any observed deficiencies should be taken.

a. The slight flow previously mentioned as occurring and collecting through the toe drainage system is indicative of the minimal through and underseepage resultant from the combination of the compacted glacial till embankment material and the steel sheet pile cutoff extending from ground surface along the centerline of the dam down to rock.

b. Although it is aesthetically unpleasing, the brush and growth on the upstream riprapped face does not cause any structural problem.

c. The observed discharge through the joint drains in the abutments and spillway section is not considered excessive, but should be monitored for changes in quantity.

SECTION 4: OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 PROCEDURES:

By New York State Law, the Spring Valley Water Company is required to discharge a minimum of 9.75 MGD from the dam. This discharge is released primarily through the Howell-Bunger valves. De Forest Lake is the first of a series of water supply reservoirs along the Hackensack River. After leaving de Forest Lake, the Hackensack River discharges into Lake Tappan (capacity: 3,378,000,000 gal.), another water supply facility, then proceeds downstream to Oradell Reservoir (capacity: 2,850,000,000 gal.), the terminus of the water supply system. The Hackensack Water Supply System serves consumers in Rockland Company, New York and Bergen Company, New Jersey.

4.2 Maintenance of Dam: The dam and associated structures are very well maintained with a regular program of lawn cutting and general maintenance in effect.

4.3 Maintenance of Operating Facilities: At the time of this inspection, repair of the west bascule gate hydraulic cylinder was under way with the gate locked in its vertical position. Repair was scheduled to be completed shortly. This repair is not considered to have any effect on the safety of the dam. Furthermore, although there was no warning system in effect at the time of the inspection other than a regular surveillance patrol, it was learned that the owner was presently contracting for an electronic surveillance system to guard against unauthorized entry into restricted areas.

4.4 Evaluation. The Lake de Forest Dam, which is approximately twenty two (22) years old is exceptionally well maintained and operated. The operating gates and valves are in good operating condition (except the bascule gate mentioned above). The dam was not designed for rapid drawdown, and therefore could not effectively be accomplished with the existing outlet works due to the relatively small discharge through the two valves as compared to the larger impoundment in the reservoir.

SECTION 5: HYDROLOGIC EVALUATION OF FEATURES

5.1 DESIGN DATA:

a. DeForest Lake Dam was designed to discharge a peak flood of 10,000 cfs. At that time, the spillway length of 100 feet and spillway elevation of 80 feet with bascule gates lowered were set.

DeForest Lake Dam was designed to function primarily as a water supply facility, not a flood detention structure. However, for the purpose of this investigation, the design features were analyzed with respect to their flood control potential. This potential was investigated through the application of the Probable Maximum Flood (PMF) to the contributing basin. The PMF is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration losses, and concentration of run-off at a specific location, that is considered reasonably possible for a particular drainage area.

The drainage area of DeForest Lake Dam is 26.6 square miles. Hydrologically, the basin characteristics are similar to those of Pascack Brook at Westwood (Drainage Area - 29.4 sq. mi.). Clark unit hydrograph parameters (Tc and R) were derived from the ratio of DeForest Lake Drainage Area to Pascack Brook Drainage Area (See Appendix II). Although a U.S.G.S. stream gage is situated on the Hackensack River one mile downstream of the dam, Clark parameters derived from the gage values are not representative of the basin because of the regulating effect of the dam as a diversion. In light of recent guidelines for determining the Probable Maximum Precipitation (Hydrometeorological Report No. 51" - Sept. 1976), the PMP index rainfall was determined to be 24.6 inches for a 24 hour duration, 200 sq. mi. basin. The percentages of the index rainfall applied to other durations were interpolated from the plot of drainage area versus percent of 24 hour, 200 sq. mi. (See Appendix II). The computed PMF peak flow was 23,497 cfs, or more than twice the design peak flow of 10,000 cfs. A plot of the PMF inflow hydrograph is included in the above appendix.

b. Assumptions made concerning the discharge - storage (capacity) of the reservoir were:

(1) That the initial storage of the reservoir prior to the PMF was 12,448 acre-feet, based on spillway crest at 80 feet.

(2) That the two Howell-Bunger valves are closed for the duration of the PMF. Only the 100 feet spillway is effective in discharging the attenuated flood. (The discharge capacity of the two valves is negligible compared to the capactiy of the spillway.).

(3) That the bascule gates are lowered to elevation 80 feet to discharge the surcharge of five feet at the beginning of the PMF.

c. The PMF was routed through the reservoir yielding a reduction of peak flow from 23,500 cfs to 15,610 cfs. The reservoir stage corresponding to the attenuated PMF was determined to be 93.5 feet (from the spillway rating curve in Appendix II). Since the top of the dam is at elevation 100 feet, the attenuated PMF was contained, leaving 6.5 feet of freeboard to the top of the

dam. An attenuated peak of nearly 28,650 cfs would correspond to the top of the dam.

5.2 EXPERIENCE DATA:

DeForest Lake Dam has been operational since 1956. During this time, it has safely discharged the floods which have occurred in the Rockland County Watershed. The maximum pool elevation was 86 feet. The maximum discharge as recorded by the U.S.G.S. gage at West Nyack was 1,550 cfs on 3 February 1973. The drought years of the mid 1960's produced the maximum drawdown elevation of 70 feet MSL.

5.3 VISUAL OBSERVATIONS:

At the time of the on-site inspection of DeForest Lake Dam, no deviations from the design plans were observed.

5.4 OVERTOPPING POTENTIAL:

No actual storm event has had sufficient magnitude and duration to approach overtopping of the dam during the 20 year period of record. The rating curves developed for this evaluation indicate that overtopping of the dam occurs at a discharge of 28,650 cfs (See Appendix II). For the hypothetical design PMF of 15,610 cfs, the maximum elevation is 93.5 or 6.5 feet below the top of the dam.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY:

a. Visual Observations. Visual observations did not indicate any existing structural problems. Both embankment and concrete sections showed no evidence of distress or deterioration. Joint drainage through the spillway joint system is well below the tolerable limit and poses no structural problem at this time.

b. Design and Construction Data. Available stability and structural calculations for the spillway have been checked using the guidelines in OCE "Recommended guidelines for safety inspection of dams, Appendix D" and EM 1110-2-2200 and were found to be satisfactory. The calculations analyze the structure for overturning, sliding, concrete stresses, and pressure on rock at four loading conditions.

Condition #1 - Reservoir empty.

Condition #2 - Reservoir with three foot thick ice and with top of ice at crest of spillway.

Condition #3 - Reservoir at flood condition with water 10 feet above crest of spillway.

Condition #4 - Reservoir at flood condition with water 10 feet above crest of spillway and bascule gate in raised position.

Using the above loading conditions the structure was checked at seven horizontal planes through the structure and at a horizontal plane through the base. The structure was found safe for overtuning and sliding. The concrete stresses and pressure on rock were acceptable. Furthermore, based on calculations contained in Appendix II, the spillway is adequate to carry the computed PMF. Although no embankment slope stability analyses were performed, embankment material is of a suitable nature to be stable at the designed and constructed slopes. The combination of compacted glacial till embankment material and the steel sheet pile cut-off extending down a sufficient depth to refusal or rock (records of sheet pile location and rock elevations available in District file) have resulted in the absence of both controlled and especially uncontrolled seepage contributing to a structurally safe dam.

c. Operating Records. Operational records of the dam are available from the Spring Valley Water Works and Supply Company. No major operational problems were reported since its completion. As the DeForest Lake Dam was designed and constructed as a water supply dam and has been subjected to a full head of water almost continuously since its construction, its stability is considered to be adequate based on performance with a factor of safety of at least one.

d. Post-Construction Changes. Since completion of this project, the Spring Valley Water Works and Supply Company has added a treatment plant to this facility. The treatment plant was not inspected as part of this study.

e. Seismic Stability. The dam is located in Seismic Zone No. 1, therefore a seismic analysis is not warranted.

SECTION 7: ASSESSMENT: RECOMMENDATIONS/REMEDIAL MEASURES

7.1 SAFETY.

The Lake de Forest Dam and the related structures of this project are in such condition that they are not unsafe. Specific recommendations outlined below are suggested at this time. As part of this investigation, the validity of the design PMF was checked with the results that the computed PMF peak flow was noticeably lower than the design value and that actual storm events have not been of sufficient magnitude and duration to approach the PMF (PMF calculations are contained in Appendix II). These determinations were made in part by the information available through the various sources listed previously in this report and the visual and engineering analysis made by the inspection group.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES.

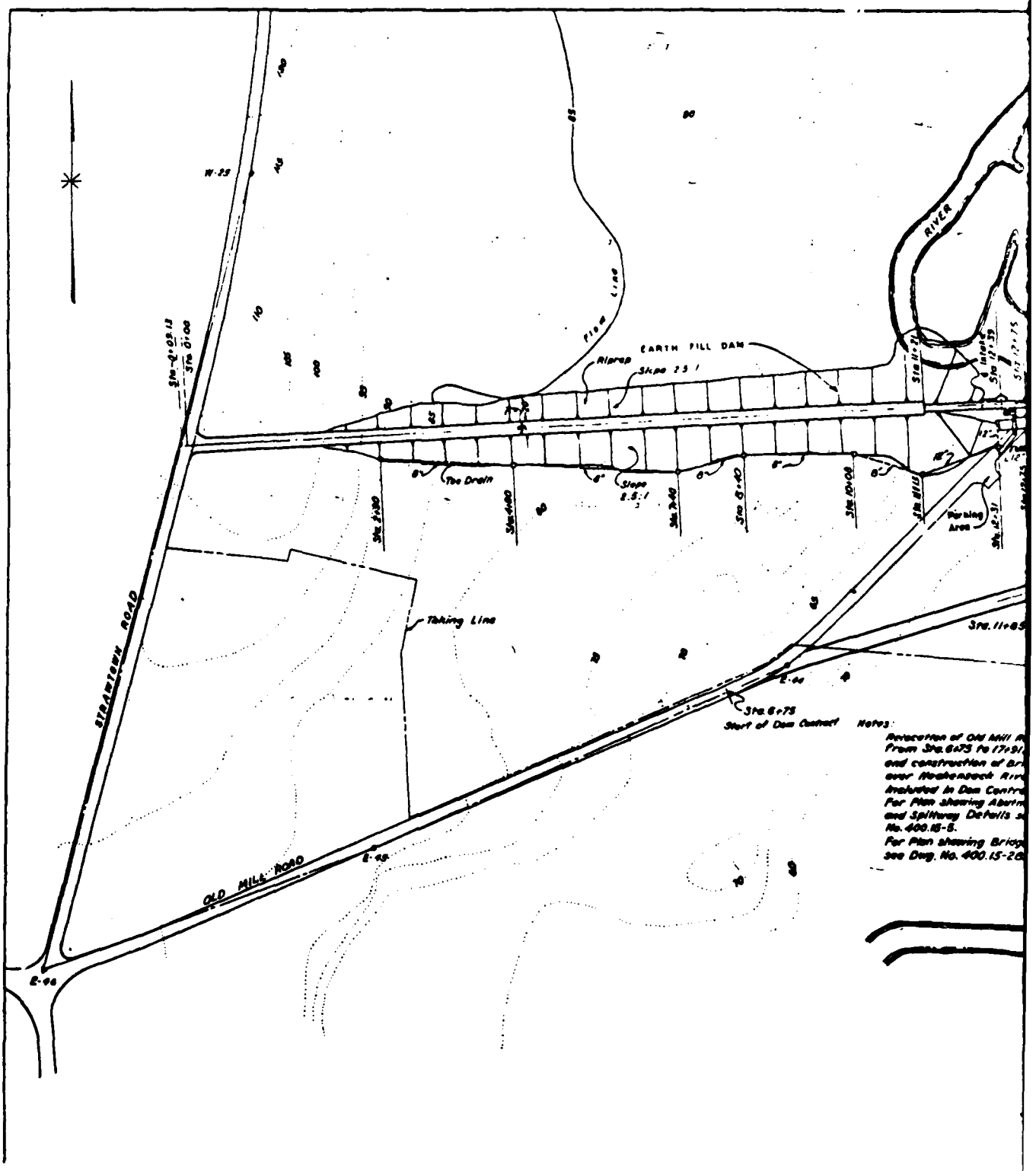
No remedial measures are necessary. However, it is recommended that the folliwng be affected:

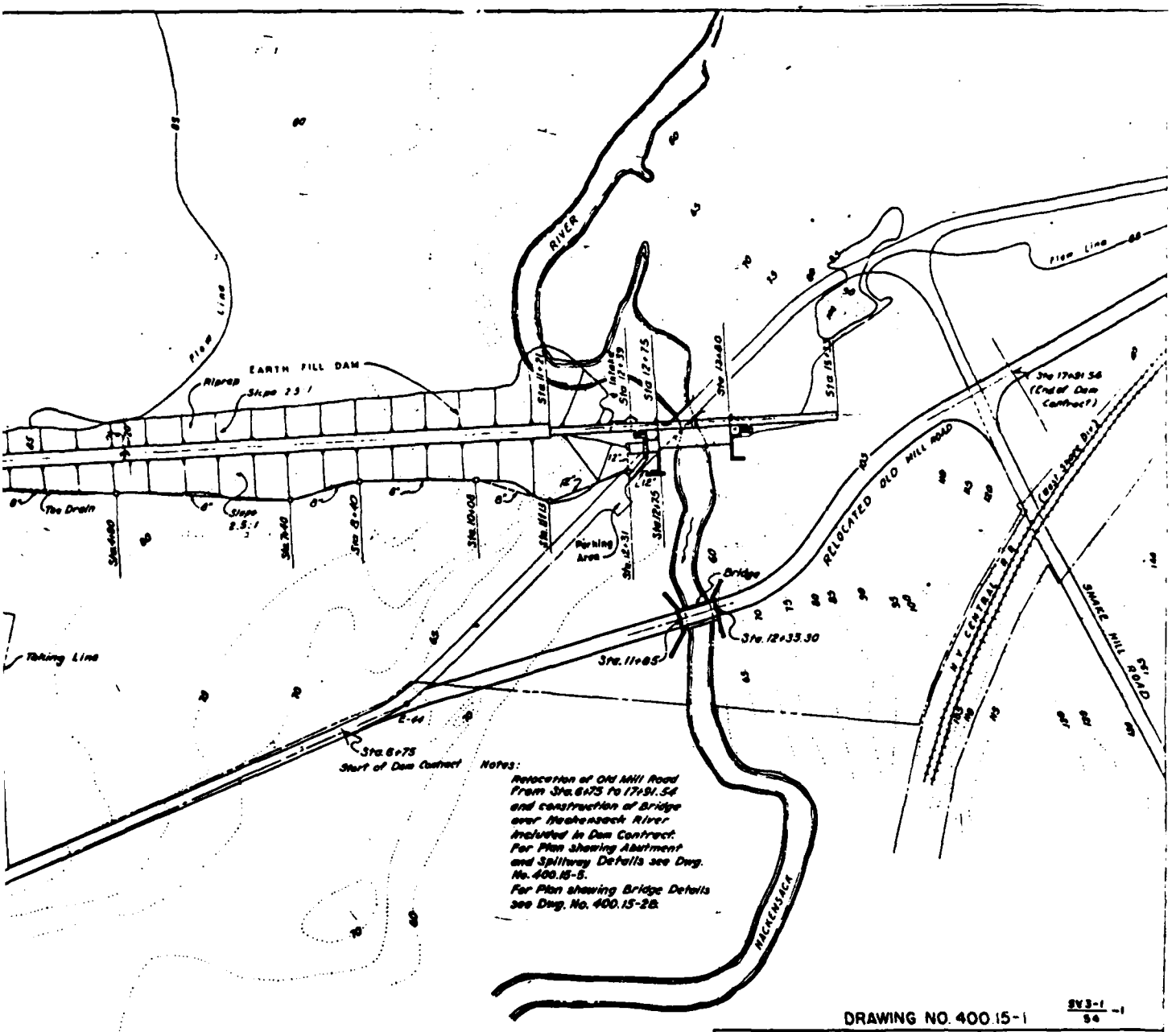
(1) As no means of quantitatively measuring toe drainage in the drain system has been provided (although this quantity is not considered significant as mentioned previously), a pipe weir should be installed in the 8-inch toe drain pipe at the manhole located at Station 11+13. Flow measurements should be made periodically to monitor changes in discharge. The flow should be related to reservoir stages.

(2) Cut and remove brush and small trees at the ground line on the upstream riprapped face with disposal off site. These trees should not be uprooted or bent over so as to create "cavities" on the embankment surface which could introduce "zones of weakness" along the face of the dam.

(3) Joint drainage in the abutments and spillway section should be monitored and measured by the installation of a V-notch weir in lieu of the flat weir plate presently being utilized. Periodic measurements should be recorded and related to reservoir stage.

(4) As field observations revealed no monitoring systems in the dam, it is recommended that a system of three piezometers be installed in the vicinity of the weir chamber (approx. Station 11+60). The piezometers should be set at different elevations to monitor pore pressures within the dam shell, the foundation material, and at a point intermediate between these locations. Pore pressures should be related to reservoir stage.


STRATTON ROAD
OLD MILL ROAD
Taking Line
Fence Line
EARTH FILL DAM
Riprap
Slope 2.5:1
Toe Drain
Slope 2.5:1
Parking Area
Sta. 6+75
Start of Dam Contract
RIVER
Notes:



Notes:
Relocation of Old Mill Road From Sta. 6+75 to 17+91.54 and construction of Bridge over Hackensack River included in Dam Contract.
For Plan showing Abutment and Spillway Details see Dwg. No. 400.15-5.
For Plan showing Bridge Details see Dwg. No. 400.15-28.

DRAWING NO. 400.15-1 SV3-1 / 54 -1

SPRING VALLEY WATER WORKS AND SUPPLY COMPANY

LAKE de FOREST DAM

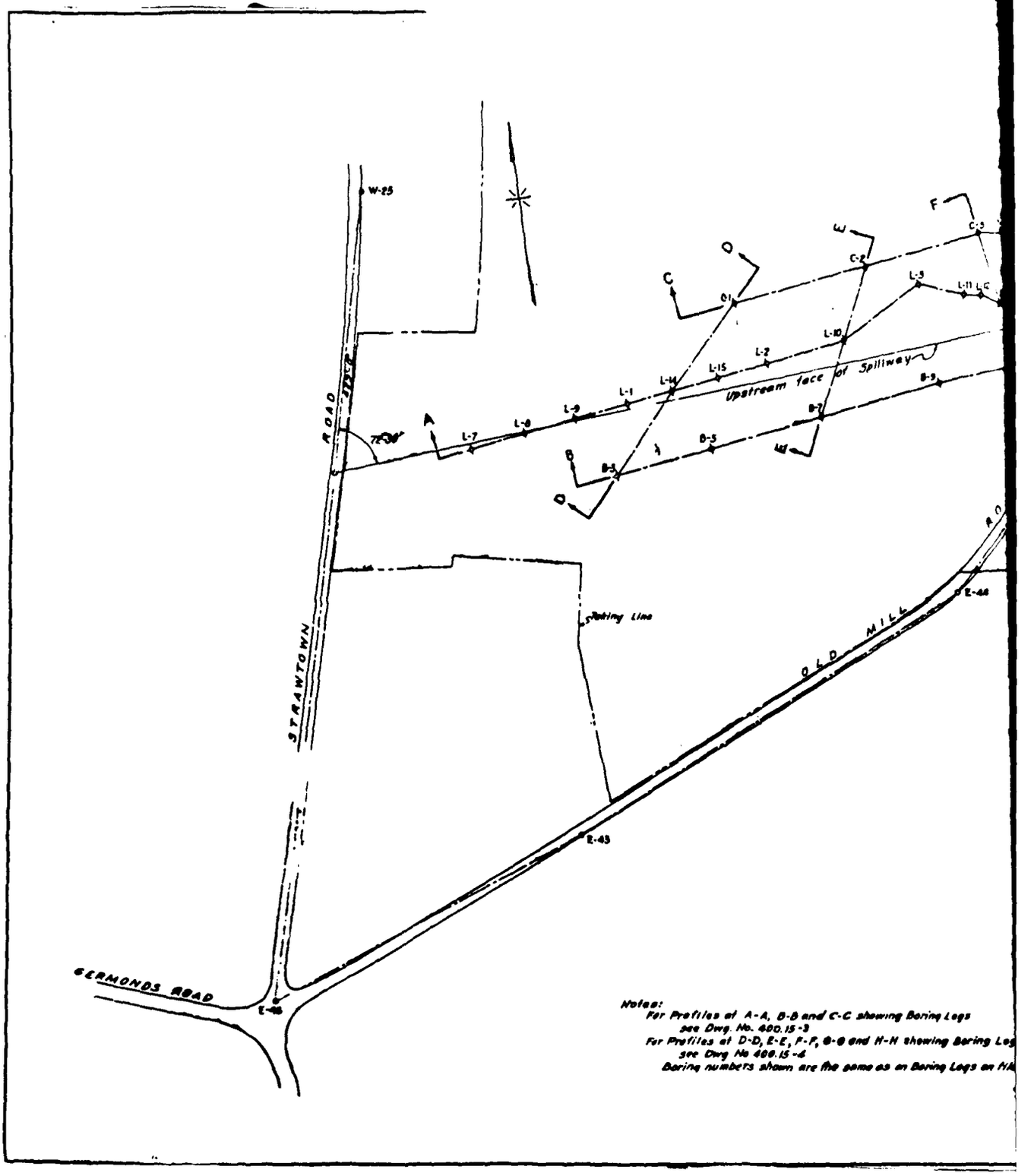
LOCATION PLAN

Buck, Seifert and Jost
Consulting Engineers
New York 3, N.Y.

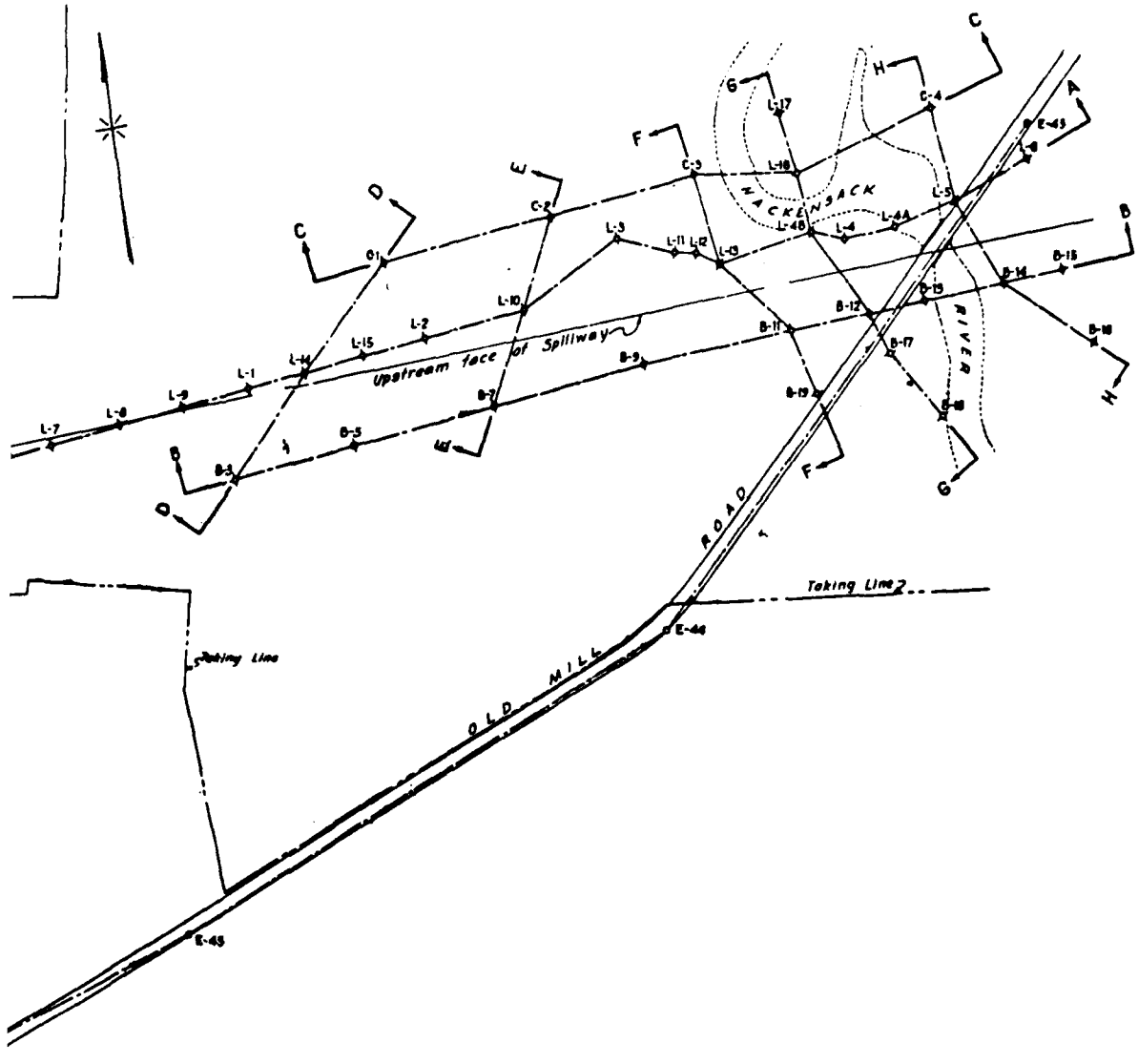
Scale: 1"=100'-0" May, 1954

Drawn by	Traced by	Checked by	Examined by	Approved by
Revisions				

2



Notes:
For Profiles at A-A, B-B and C-C showing Boring Logs
see Dwg. No. 400.15-3
For Profiles at D-D, E-E, F-F, G-G and H-H showing Boring Log
see Dwg No 400.15-4
Boring numbers shown are the same as on Boring Logs on Fil



DRAWING NO. 400.15-2 $\frac{SV\ 3-1}{64}$-2

Notes:
For Profiles at A-A, B-B and C-C showing Boring Logs see Dwg. No. 400.15-3
For Profiles at D-D, E-E, F-F, G-G and H-H showing Boring Logs see Dwg No 400.15-4
Boring numbers shown are the same as on Boring Logs on file.

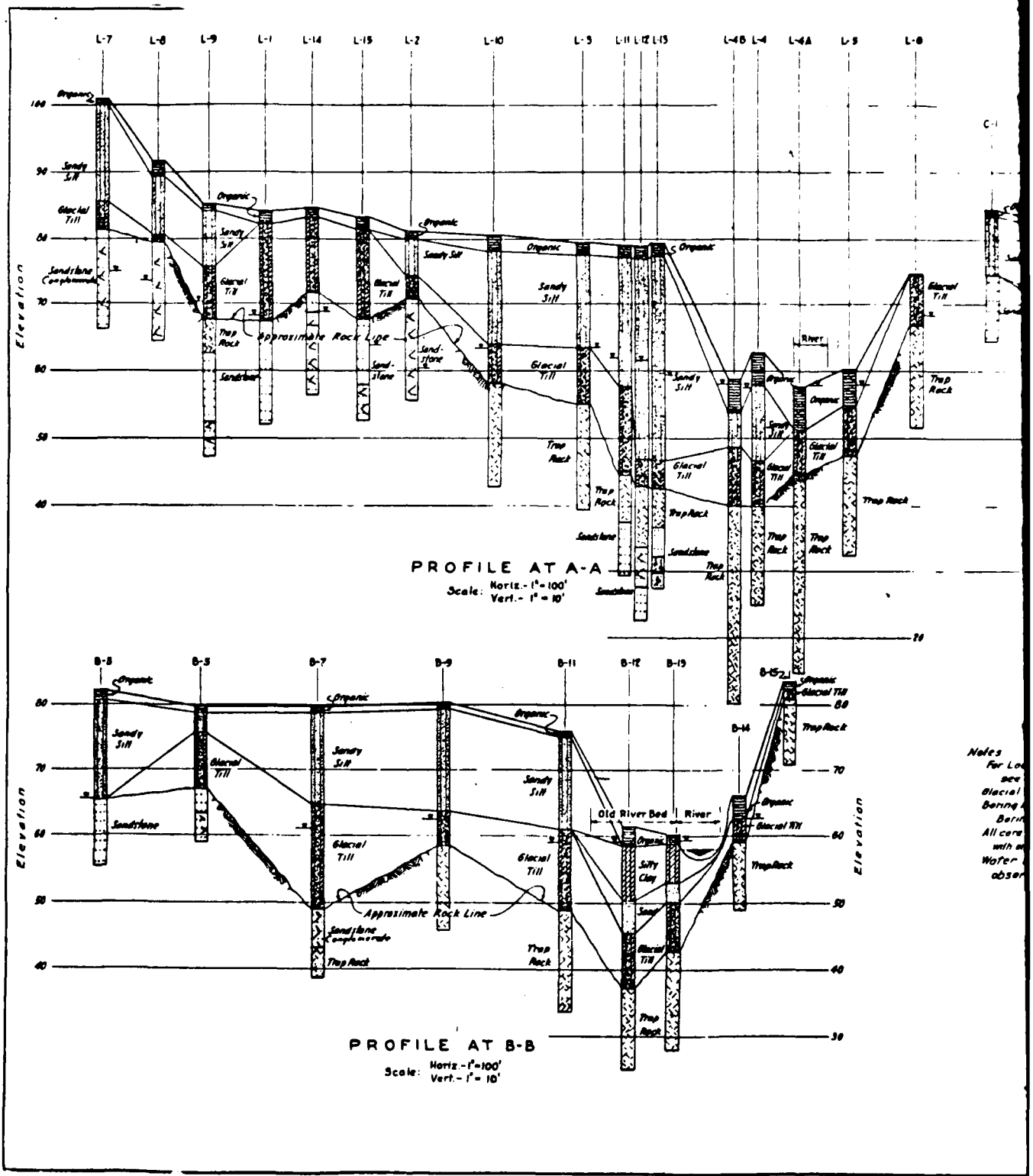
SPRING VALLEY WATER WORKS AND SUPPLY COMPANY
LAKE de FOREST
DAM
BORING LOCATIONS
PLAN

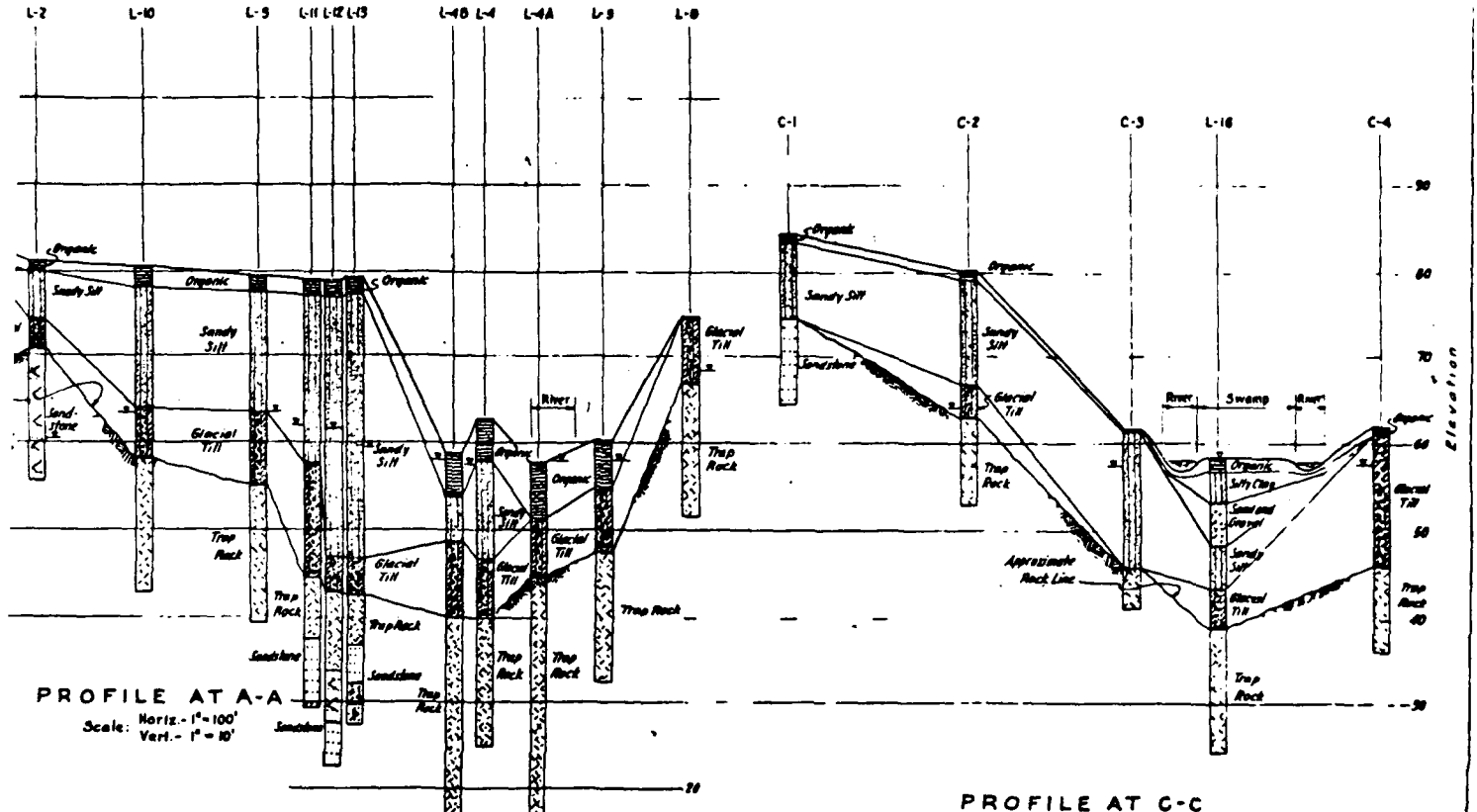
Buck, Seifert and Jost
Consulting Engineers
New York 3, N.Y.

Scale: 1"-100'
May, 1954

Drawn by: RHS	Checked by: DJF EHW	Approved by:
Revisions:		

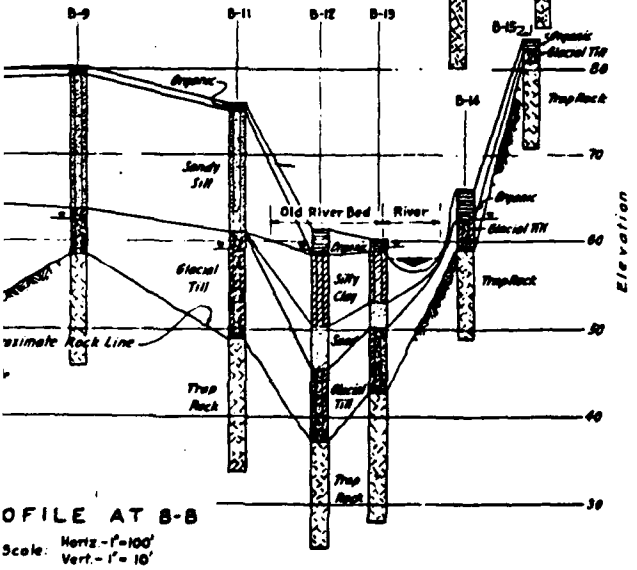
2


L-7
L-8
L-9
L-1
L-14
L-15
L-2
L-10
L-3
L-11
L-12
L-13
L-4B
L-4
L-4A
L-5
L-6
Elevation
Organic
Sandy Silt
Glacial Till
Sandstone
Trap Rock
Approximate Rock Line
Sandstone Conglomerate
Silty Clay
River
Old River Bed
PROFILE AT A-A
Scale: Horiz.- 1"=100'
Vert.- 1"= 10'
B-8
B-5
B-7
B-9
B-11
B-12
B-13
B-14
B-15
PROFILE AT B-B
Scale: Horiz.- 1"=100'
Vert.- 1"= 10'



PROFILE AT A-A

Scale: Horiz.- 1"=100'
Vert.- 1"=10'



OFILE AT B-B

Scale: Horiz.-1"=100'
Vert.-1"=10'

PROFILE AT C-C

Scale: Horiz.- 1"=100'
Vert.- 1"=10'

Notes:
For Location of Profiles A-A, B-B and C-C see Dwg. No. 400.15-B.
Glacial Till region contains boulders.
Boring numbers shown are same as on Boring Logs on file.
All core borings encountered seamy rock with only partial or no recovery of wash water.
Water levels shown thus: ▽ were those observed at the time the Borings were made.

DRAWING No. 400.15-3 SV3-1 / 84 -3

SPRING VALLEY WATER WORKS AND SUPPLY COMPANY

LAKE de FOREST

DAM

BORING LOCATIONS

PROFILES

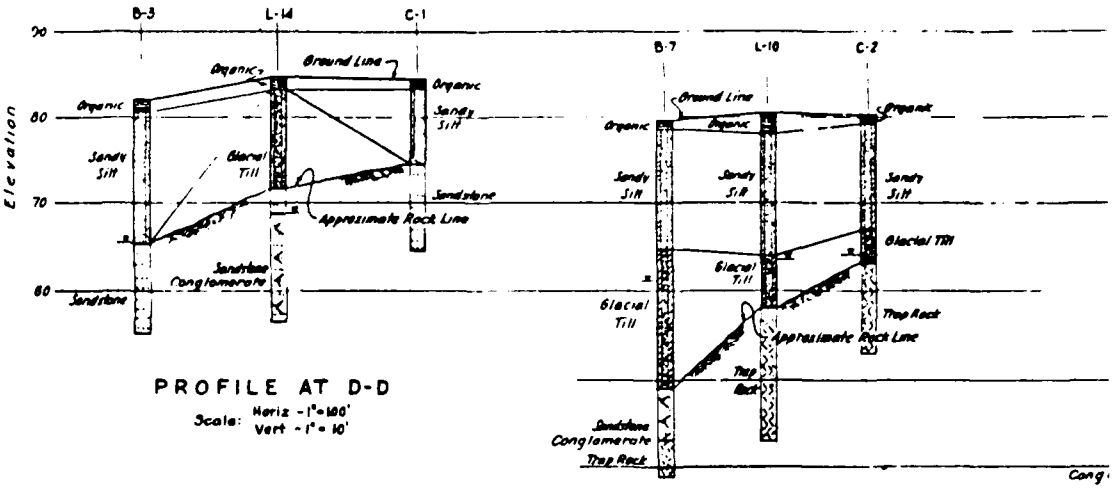
Buck, Seifert and Jost
Consulting Engineers
New York 3, N.Y.

Scale: As shown

May, 1954

Drawn by: RWS	Checked by D.P. GW	Approved by:
Revisions:		

2

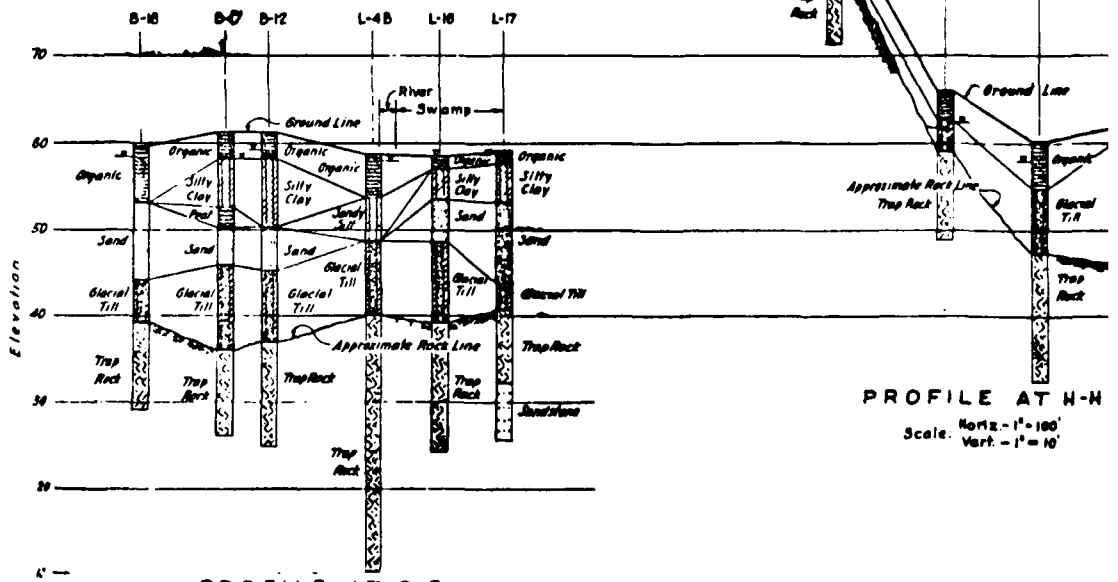


PROFILE AT D-D

Scale: Horiz - 1"=100'
Vert - 1"= 10'

PROFILE AT E-E

Scale: Horiz.- 1"=100'
Vert. - 1"= 10'

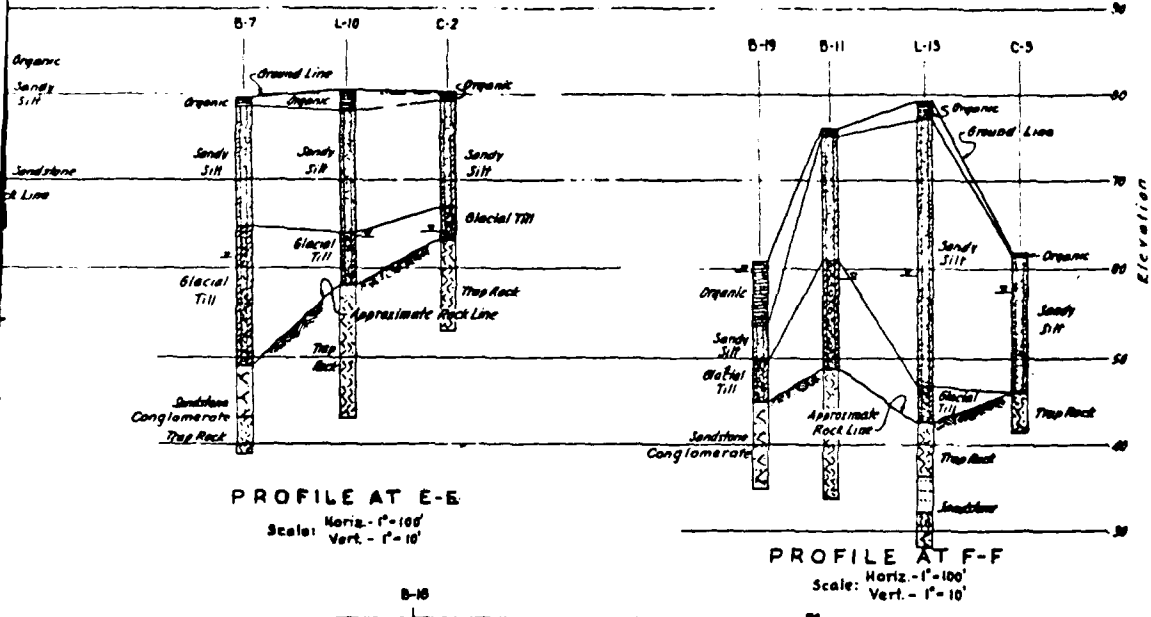


PROFILE AT G-G

Scale: Horiz - 1"=100' Vert - 1"= 10'

PROFILE AT H-H

Scale: Horiz.- 1"=100'
Vert. - 1"= 10'

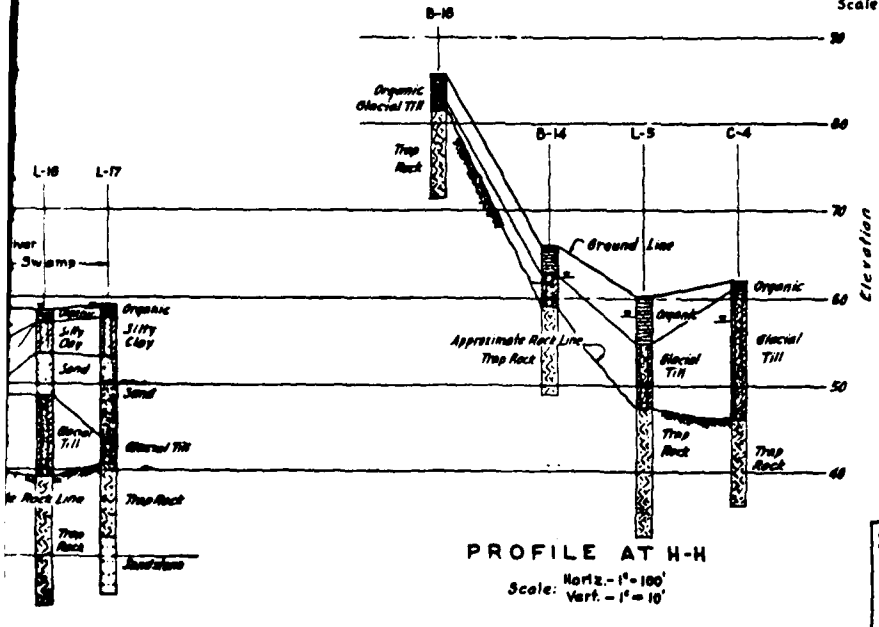


PROFILE AT E-E

Scale: Horiz. - 1" = 100'
Vert. - 1" = 10'

PROFILE AT F-F

Scale: Horiz. - 1" = 100'
Vert. - 1" = 10'



PROFILE AT H-H

Scale: Horiz. - 1" = 100'
Vert. - 1" = 10'

Notes:
For Location of Profiles at D-D, E-E, F-F, G-G and H-H see Dwg. No. 400.15-2.
Glacial Till region contains boulders
Boring numbers shown are same as on Boring Logs on file.
All core borings encountered sound rock with only partial or no recovery of wash water.
Water levels shown thus: ▽, were those observed at the time the Borings were made.

DRAWING No. 400.15-4 SVW-L-4 64

SPRING VALLEY WATER WORKS AND SUPPLY COMPANY

LAKE de FOREST

DAM

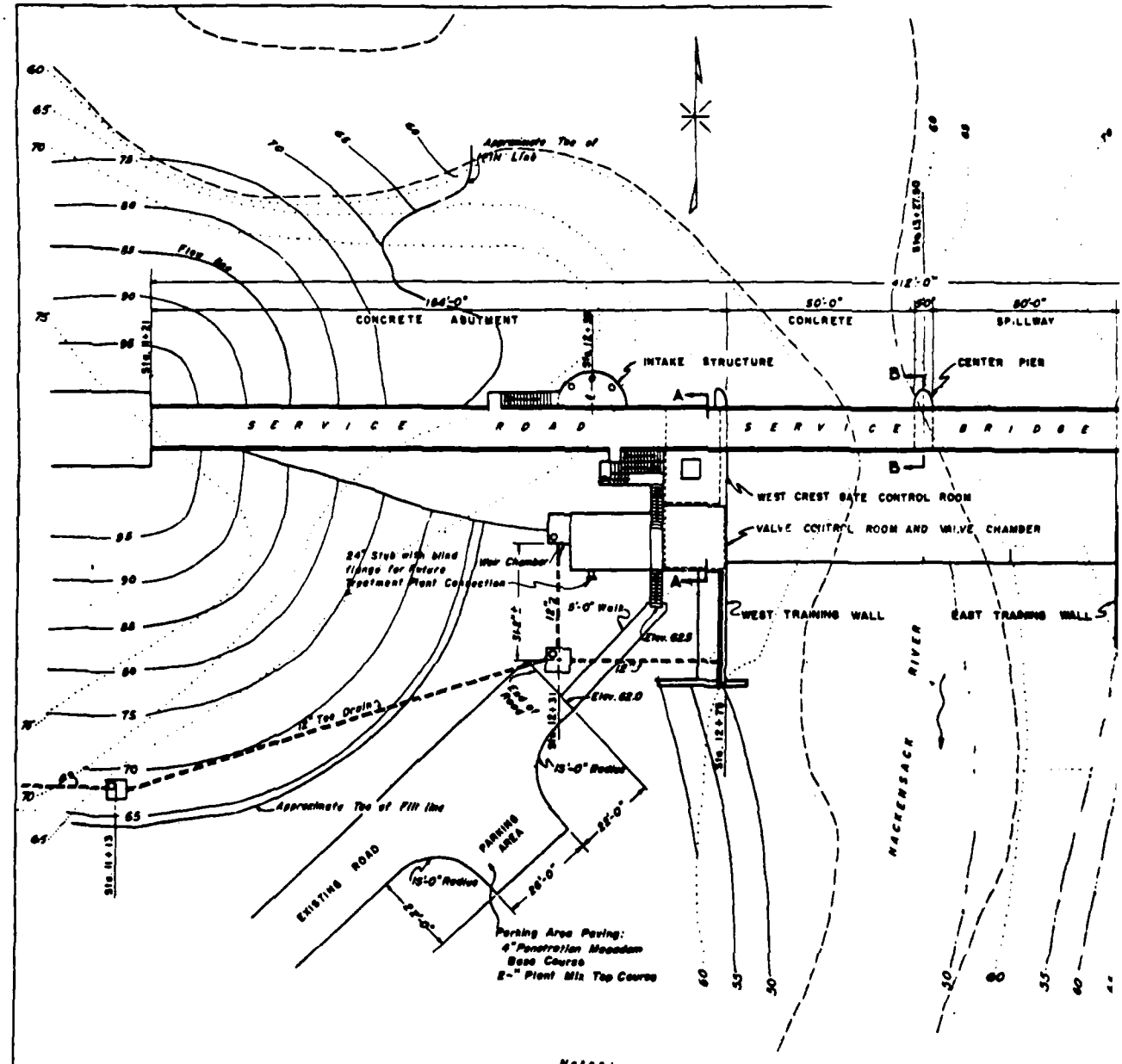
BORING LOCATIONS

PROFILES

Buck, Seifert and Jost
Consulting Engineers
New York 3, N.Y.

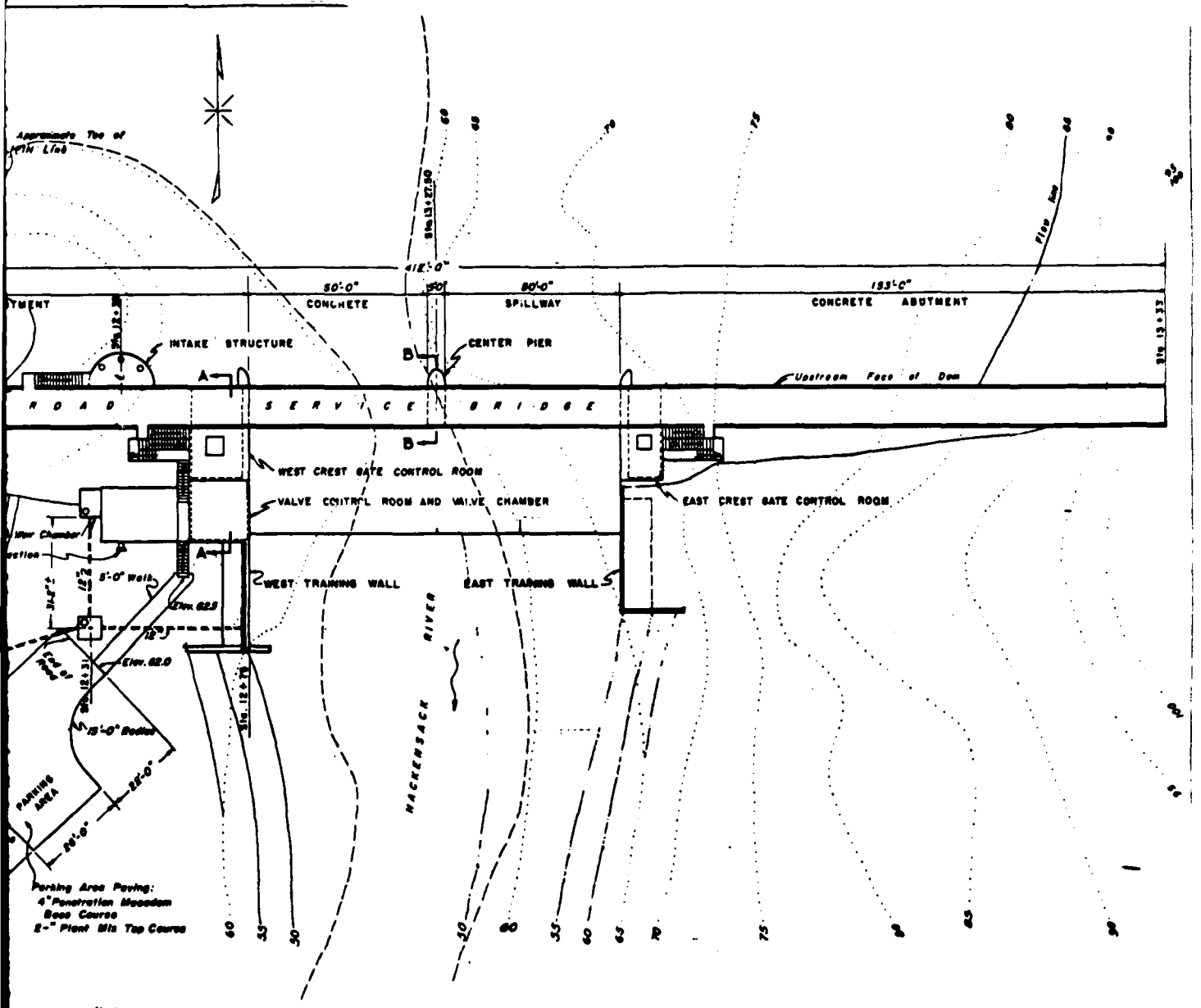
Scale: As shown — May, 1954

Drawn by: RMD	Checked by: JP JSH	Approved by:
Revisions:		



Notes:

For Upstream and Downstream Dam Elevations see Dwg. No. 400.18-6.
For Typical Section of Concrete Abutment see Dwg. No. 400.18-7
For Typical Section of Concrete Spillway see Dwg. No. 400.18-8.
For Profile and Details of Toe Drain see Dwg. No. 400.18-10.
For Plans, Sections and Details of Intake Structure see Dwgs No. 400.18-11, 12 and 13.
For Section A-A, see Dwg. No. 400.18-14.
For Details of West Crest Gate Control Room, Valve Control Room and Valve Chamber, see Dwgs. No. 400.18-14, 15 and 16.
For Plans, Sections and Details of East Crest Gate Control Room, see Dwgs. No 400.18-17 and 18.
For Plans, Sections and Details of Service Bridge see Dwg. No. 400.18-19
For Section B-B see Dwg. No. 400.18-20
For Details of West Training Wall see Dwg. No. 400.18-21
For Details of East Training Wall see Dwg. No. 400.18-22



Notes:

For Upstream and Downstream Dam Elevations see Dwg. No. 400.18-6.
For Typical Section of Concrete Abutment see Dwg. No. 400.18-7.
For Typical Section of Concrete Spillway see Dwg. No. 400.18-8.
For Profile and Details of Toe Drain see Dwg. No. 400.18-10.
For Plans, Sections and Details of Intake Structure see Dwgs. No. 400.18-11, 12 and 13.
For Section A-A, see Dwg. No. 400.18-14.
For Details of West Crest Gate Control Room, Valve Control Room and Valve Chamber, see Dwgs. No. 400.18-14, 15 and 16.
For Plans, Sections and Details of East Crest Gate Control Room, see Dwgs. No 400.18-17 and 18.
For Plans, Sections and Details of Service Bridge see Dwg. No. 400.18-19
For Section B-B see Dwg. No. 400.18-20
For Details of West Training Wall see Dwg. No. 400.18-21
For Details of East Training Wall see Dwg. No. 400.18-22

DRAWING NO. 400.15-5 SV3-1 / 54-8

SPRING VALLEY WATER WORKS AND SUPPLY COMPANY

LAKE de FOREST DAM

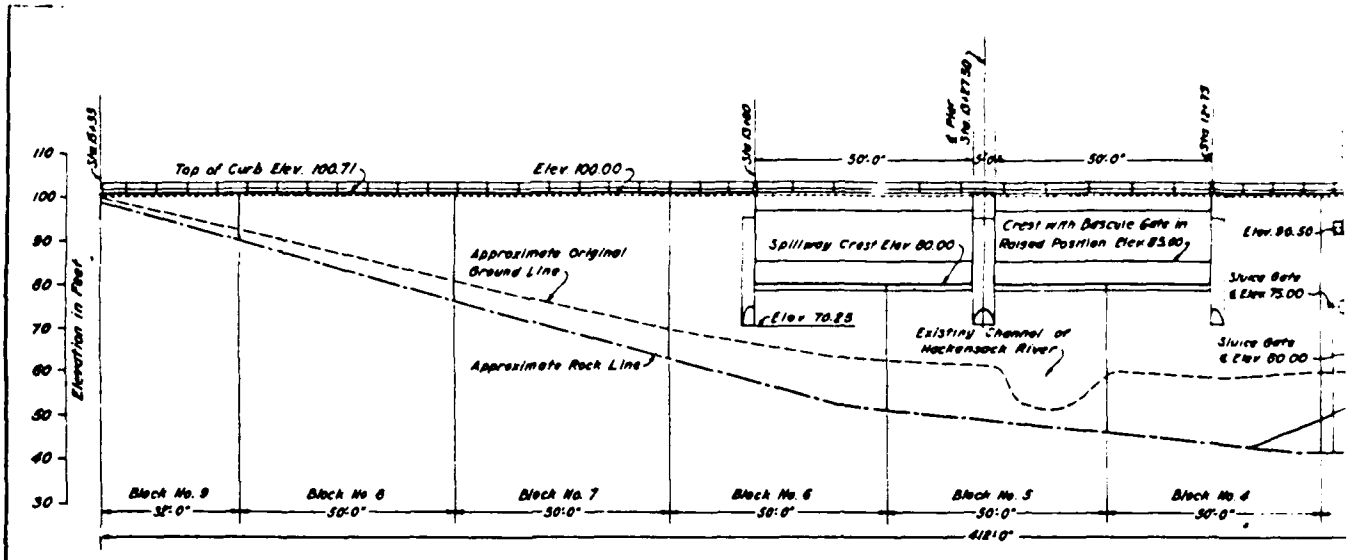
GENERAL PLAN

Buck, Seifert and Jost
Consulting Engineers
New York 3, N.Y.

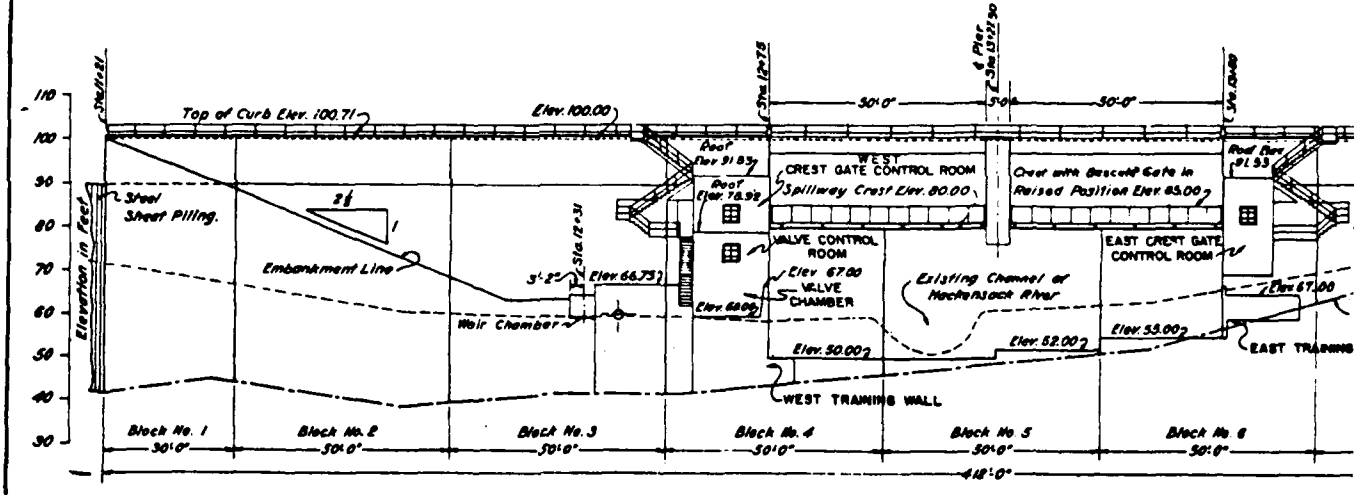
Scale 1" = 20' May, 1954

Drawn by SR	Traced by HNS	Checked by DJ	Examined by DM	Approved by
Revisions				

2

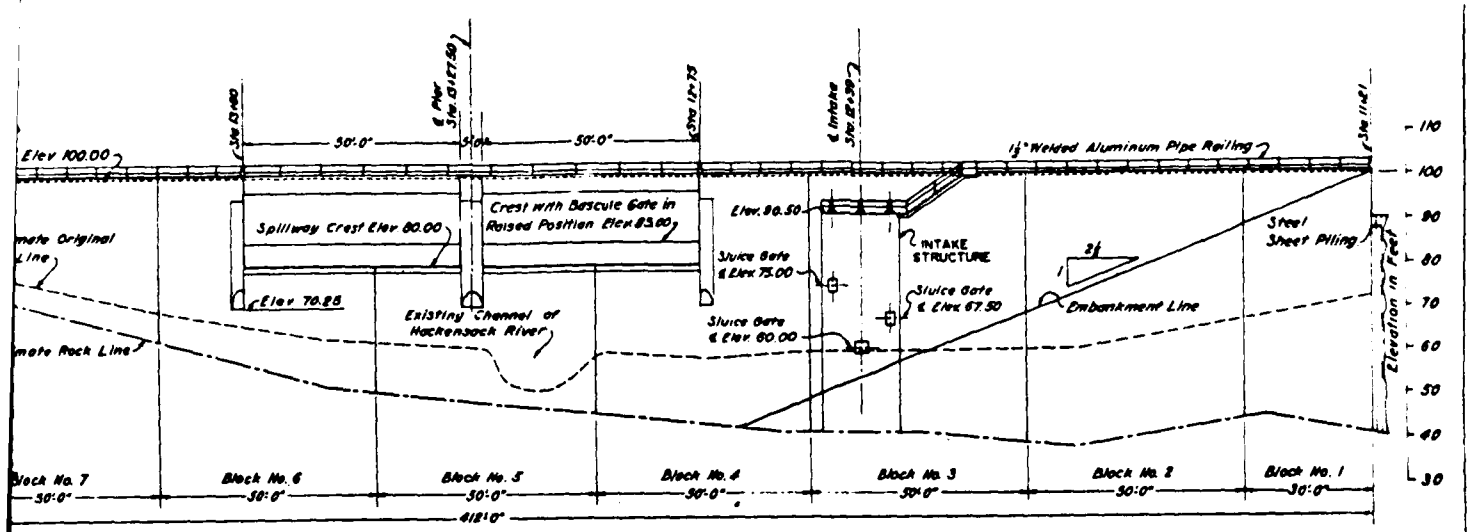


UPSTREAM FACE

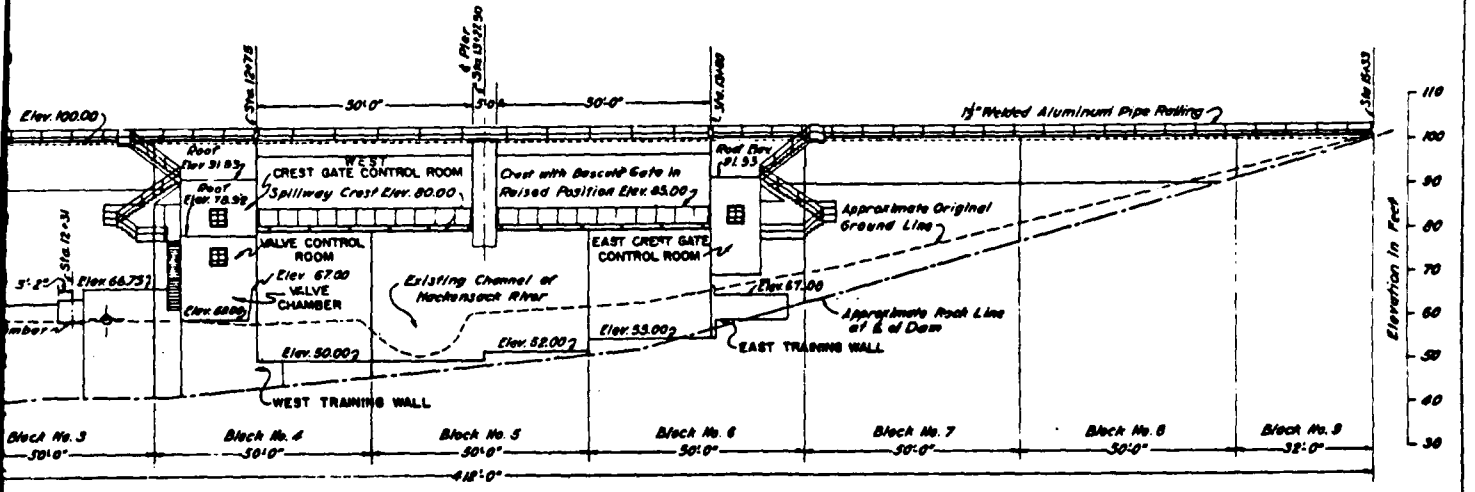


DOWNSTREAM FACE

Notes:
For Location Plan, see Dwg. No. 400.18-1.
For General Plan, see Dwg. No. 400.18-5.



UPSTREAM FACE



DOWNSTREAM FACE

Notes:
For Location Plan, see Dwg. No. 400.15-1.
For General Plan, see Dwg. No. 400.15-5.

DRAWING NO 400.15-6 SV3-1-6 64

SPRING VALLEY WATER WORKS AND SUPPLY COMPANY

LAKE de FOREST

DAM

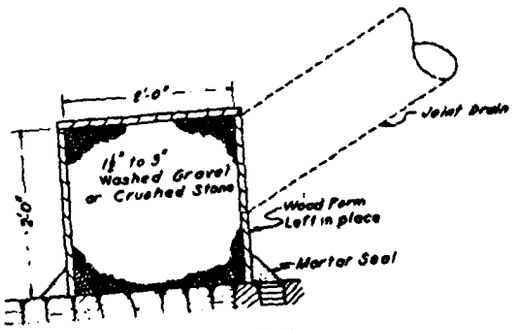
ELEVATIONS

Buck, Seifert and Jost
Consulting Engineers
New York 3, N Y

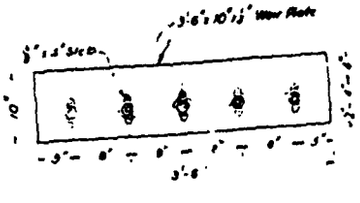
Scale 1"=20'-0" May, 1954

Drawn by	Traced by	Checked by DP	Examined by	Approved by
Revisions				

2

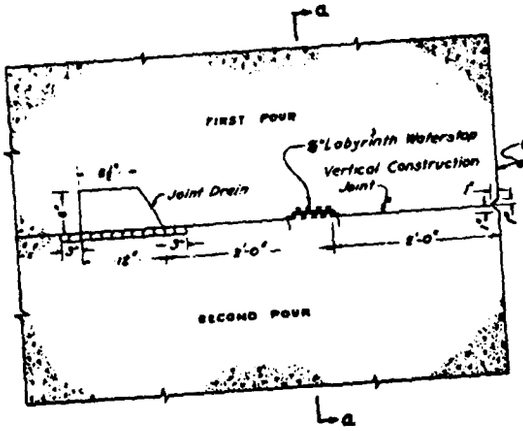


GRAVEL DRAIN SECTION
Scale 1"-1'-0"



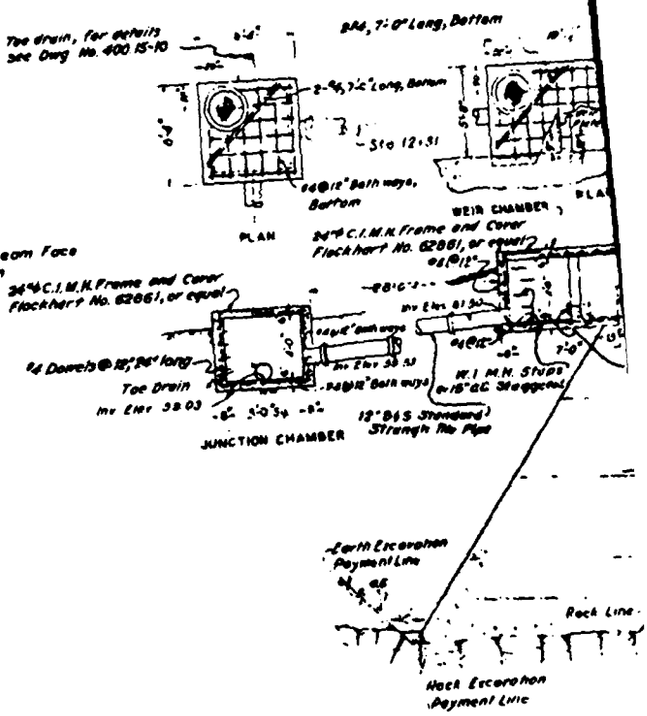
ELEVATION

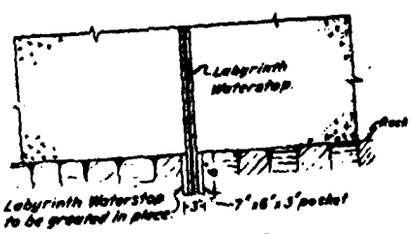
WEIR PLATE DETAIL
Scale 1"-1'-0"



PLAN

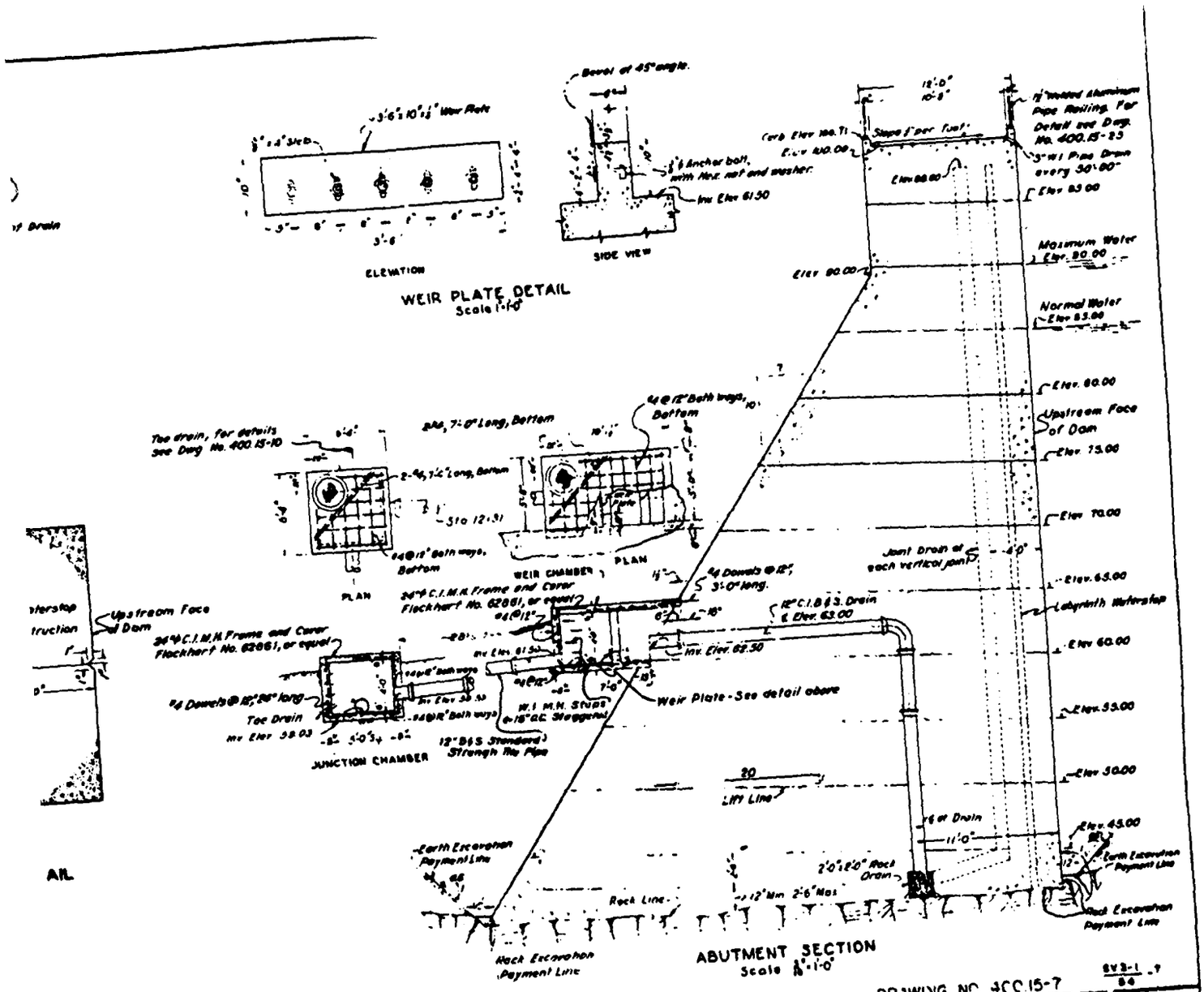
VERTICAL CONSTRUCTION JOINT DETAIL
Scale 1"-1'-0"





SECTION a-a
Scale 1"=1'-0"

Notes.
For General Plan see Dwg. No. 400.15-5.



DRAWING NO. 400.15-7

SPRING VALLEY WATER WORKS AND SUPPLY COMPANY

LAKE de FOREST

DAM

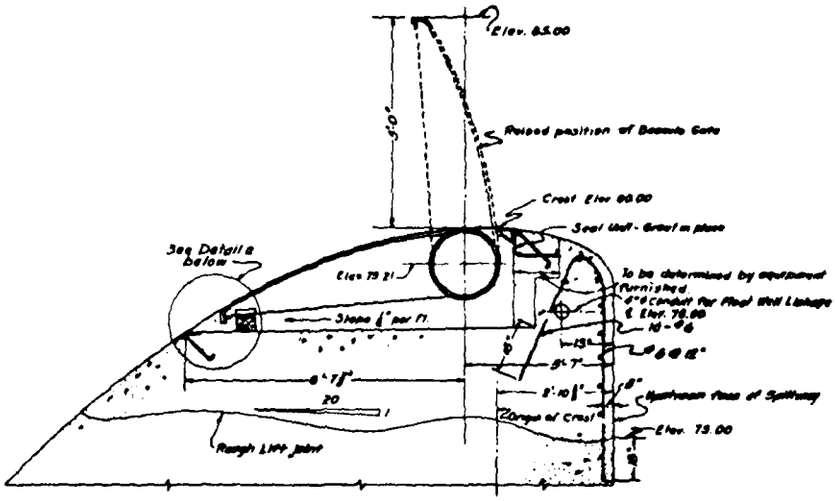
ABUTMENT SECTION AND DETAILS

Buck, Seifert and Jost
Consulting Engineers
New York 3, N.Y.

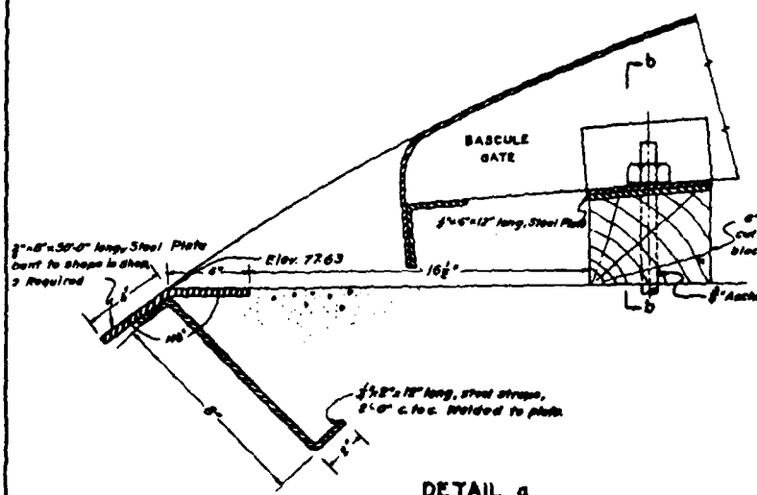
May, 1954

As shown

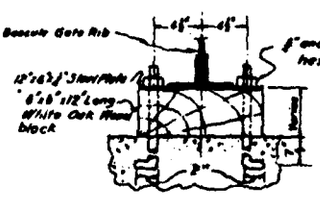
2



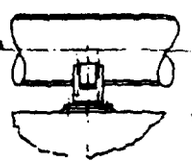
BASCULE GATE POCKET DETAIL
Scale 1"=1'-0"



DETAIL a
Scale 3"=1'-0"

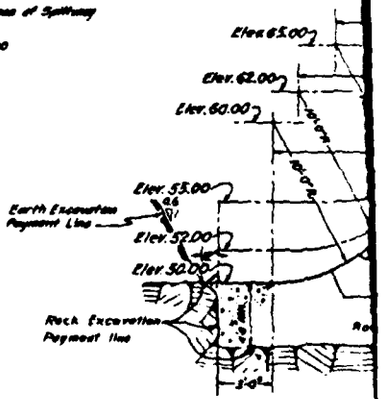


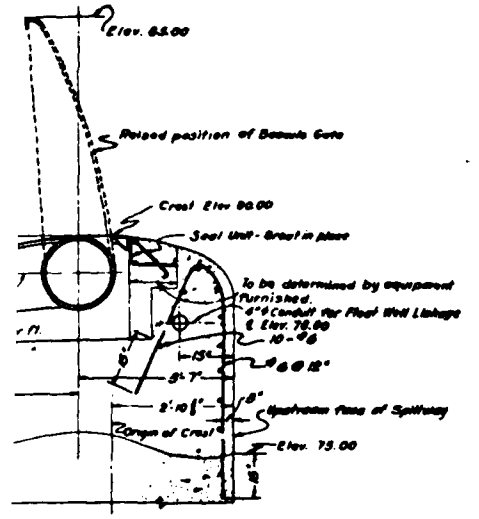
SECTION b-b
Scale 1"=1'-0"



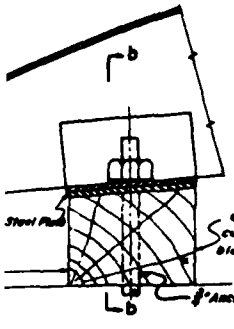
SECTION c-c

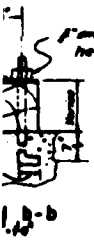
GATE SHAFT BEARING DETAIL
Scale 1"=1'-0"



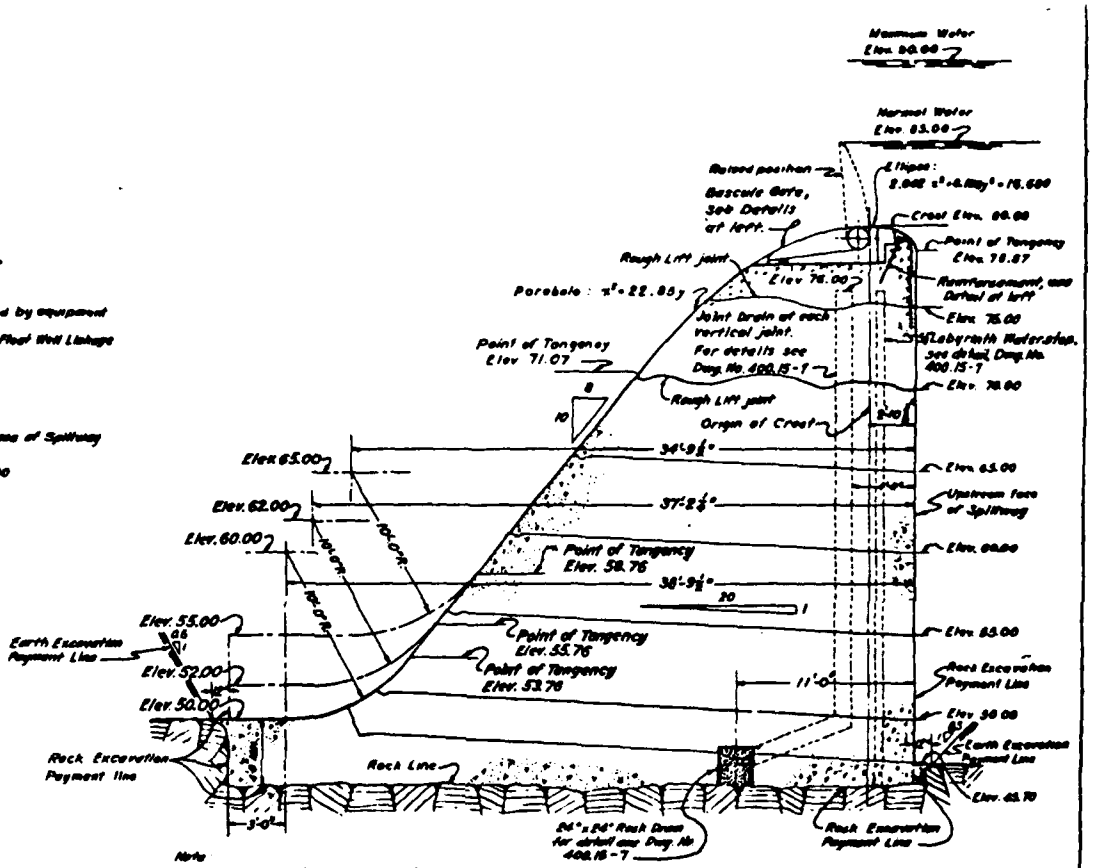


KET DETAIL



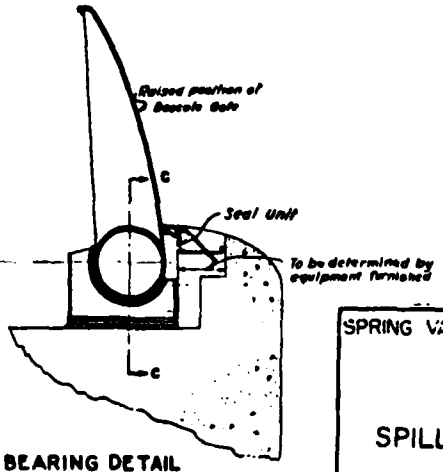


1.b-b



SPILLWAY SECTION
Scale ¼"=1'-0"

Note
Where the original rock surface is above elevations shown, rock excavation below these elevations will be paid for to the lines and grades established by the Engineer.



SECTION c-c

GATE SHAFT BEARING DETAIL
Scale ½"=1'-0"

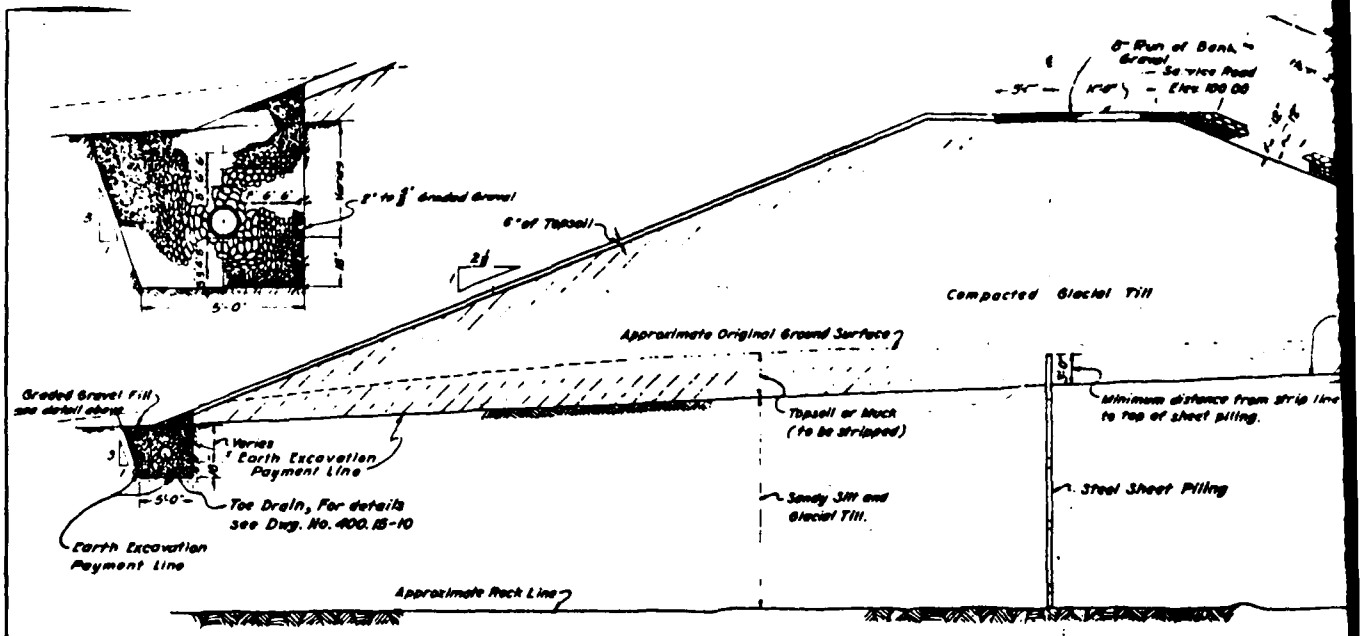
Notes:
For General Plan, see Dwg No. 400.15-8.

DRAWING NO. 400.15-8 SVS-1 / 84-8

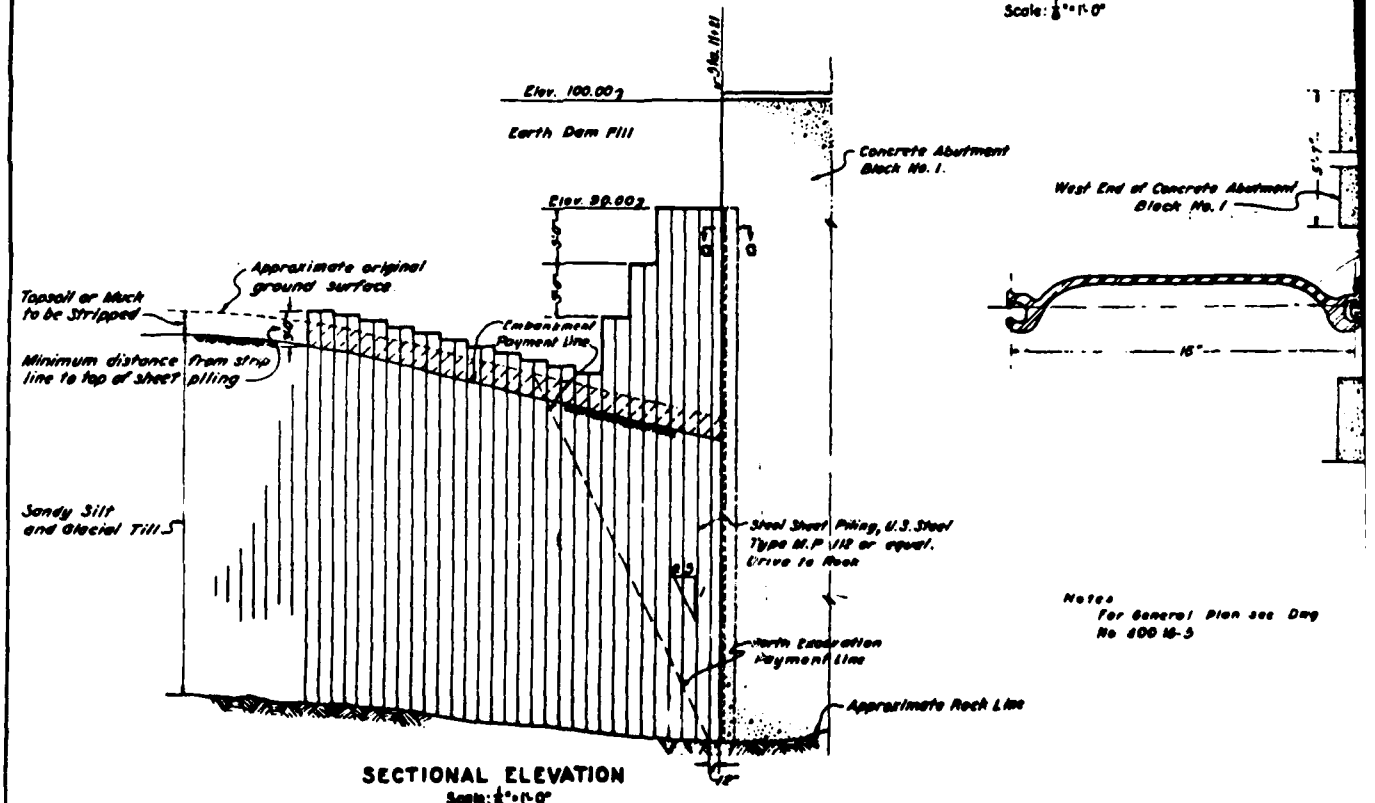
SPRING VALLEY WATER WORKS AND SUPPLY COMPANY
LAKE de FOREST
DAM
SPILLWAY SECTIONS AND DETAILS
Buck, Seifert and Jost
Consulting Engineers
New York 3, N.Y.
Scale As shown
May, 19?-

Drawn by SR	Traced by JFR	Checked by DJP	Examined	Approved by
Revisions				

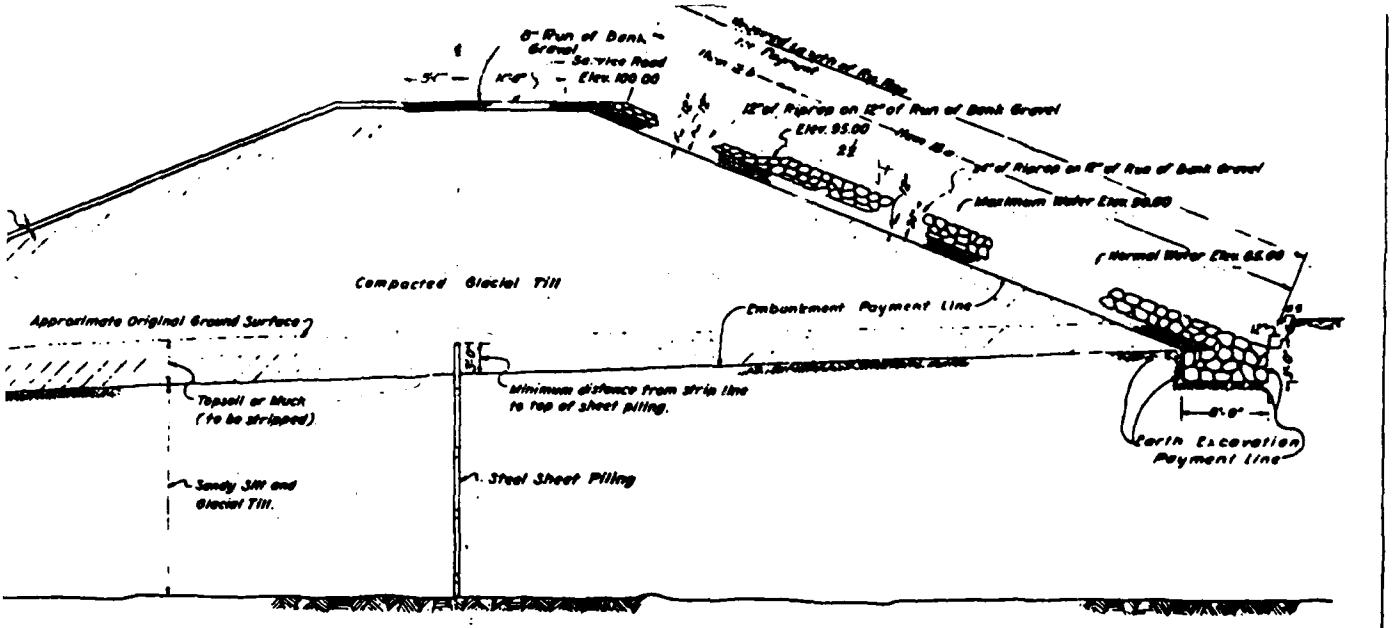
a



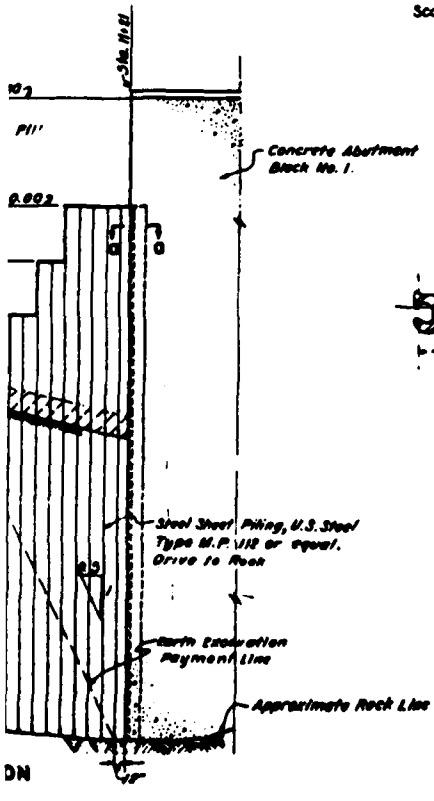
TYPICAL EARTH DAM SECTION
Scale: 1/8"=1'-0"

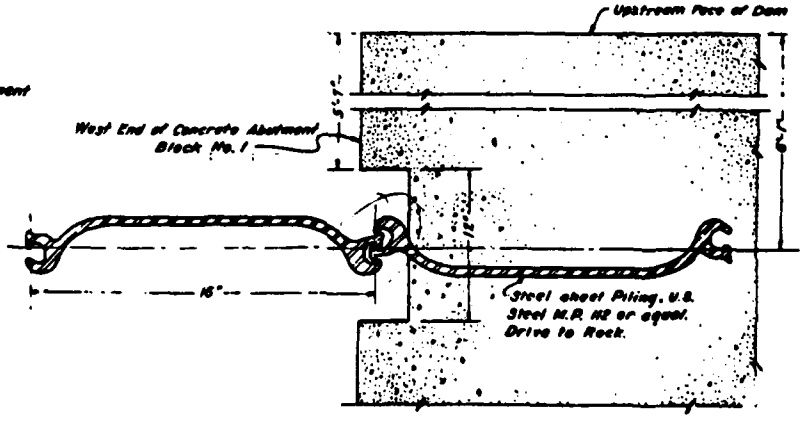


SECTIONAL ELEVATION
Scale: 1/8"=1'-0"



TYPICAL EARTH DAM SECTION
Scale: 1/8" = 1'-0"





SECTION a-a
Scale: Not to Scale

Notes.
For General Plan see Dwg No. 400.15-3

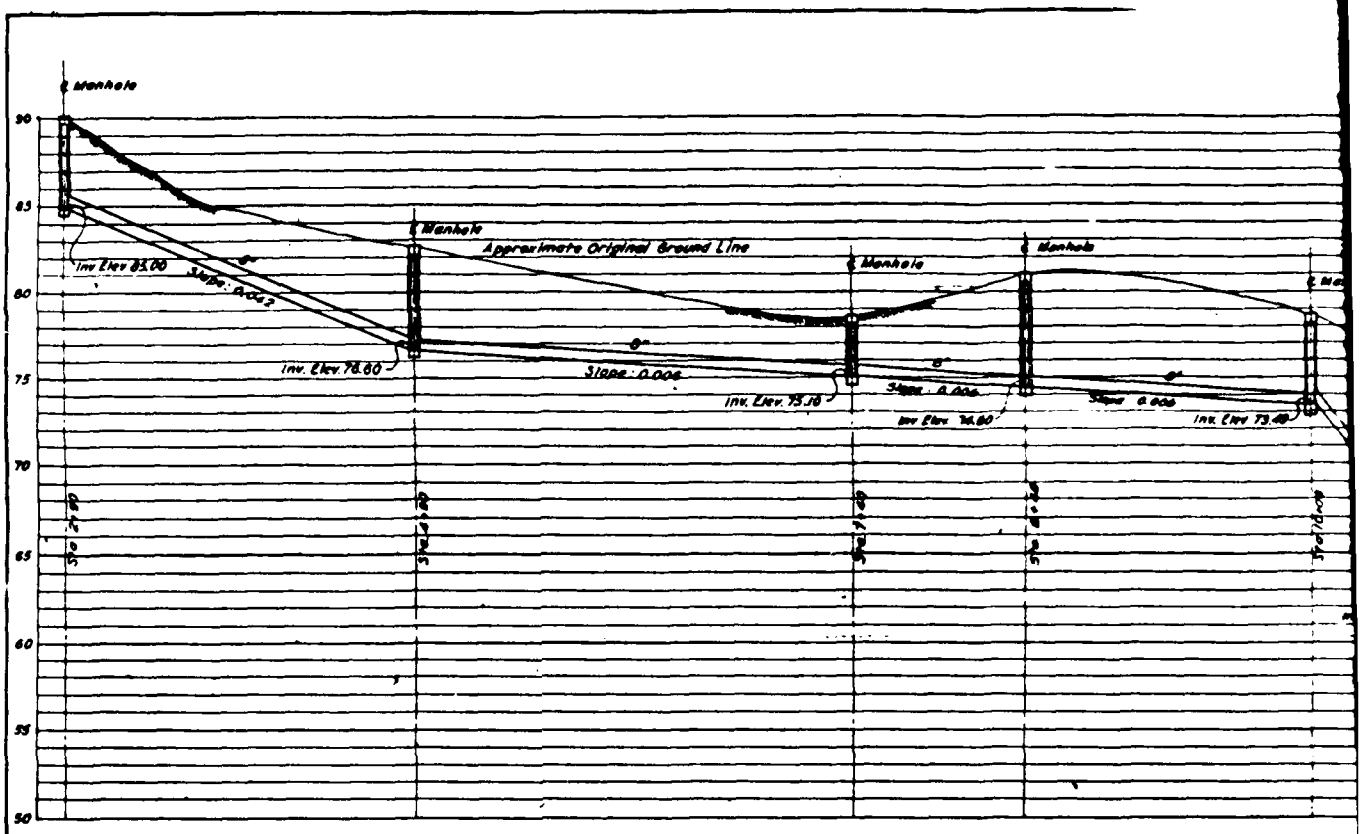
DRAWING NO. 400.15-9 SV3-1 / 84 -9

SPRING VALLEY WATER WORKS AND SUPPLY COMPANY
LAKE de FOREST
DAM
EARTH FILL SECTION AND DETAILS

Buck, Seifert and Jost
Consulting Engineers
New York 3, N.Y.

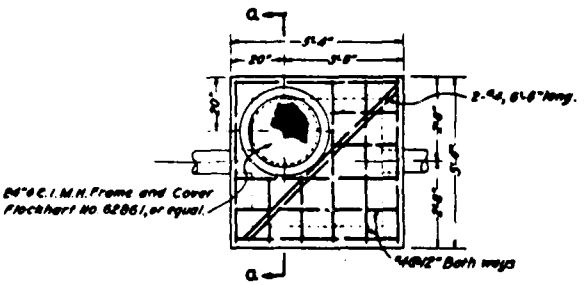
Scale As shown — May, 1954

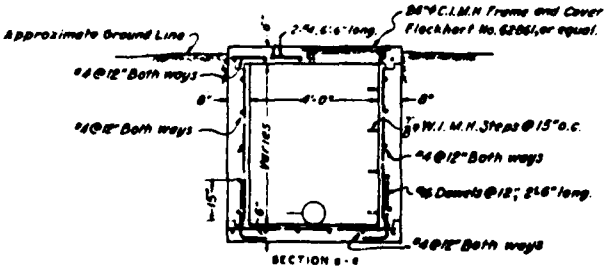
Drawn by SR	Traced by GPM	Checked by JJF	Examined by	Approved by
Revisions				



TOE DRAIN PROFILE

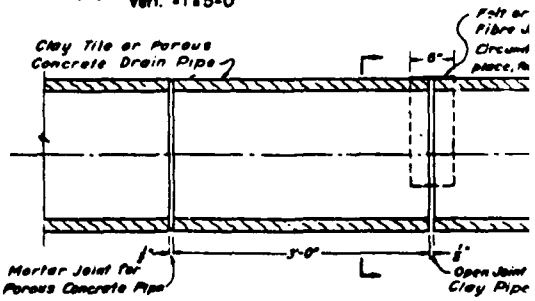
Scale: Horiz. = 1"=50'-0"
Vert. = 1"=5'-0"





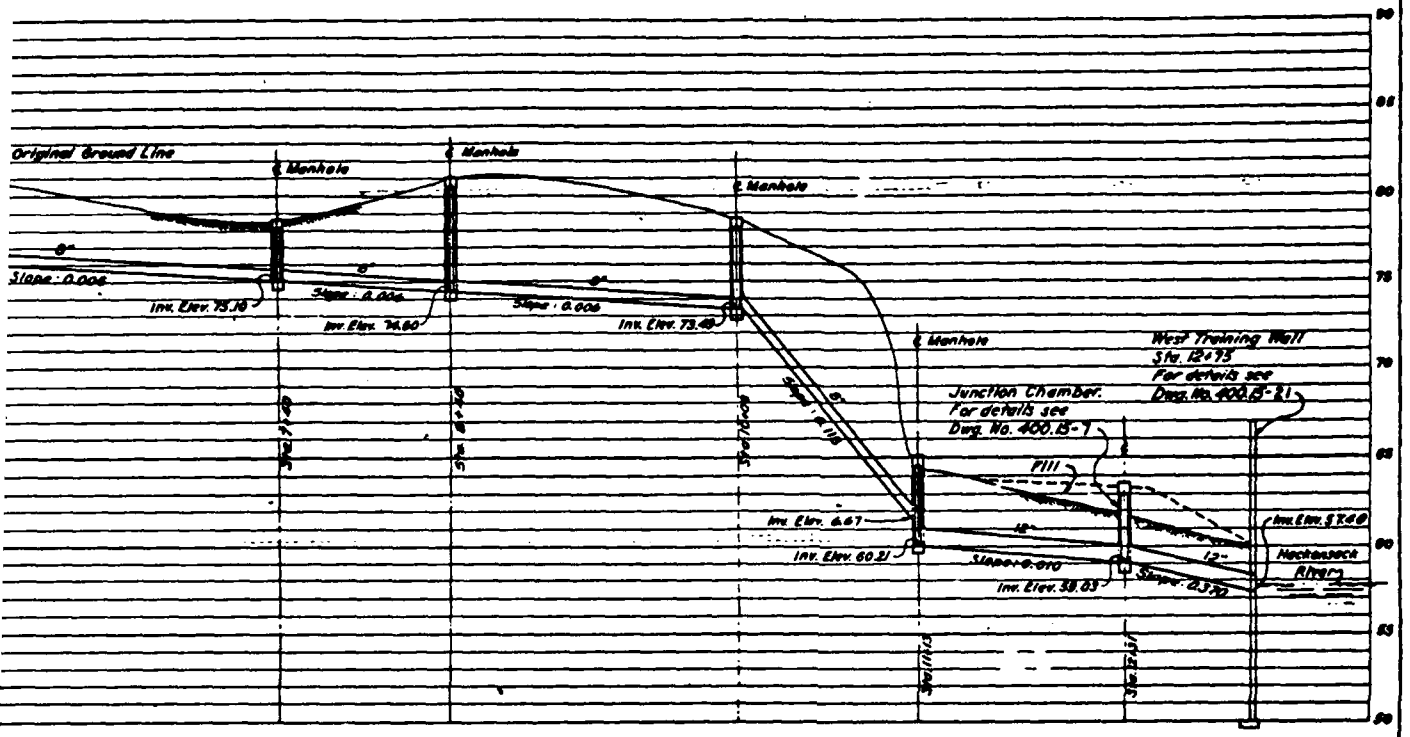
TYPICAL MANHOLE DETAILS

Scale: 1/2"=1'-0"



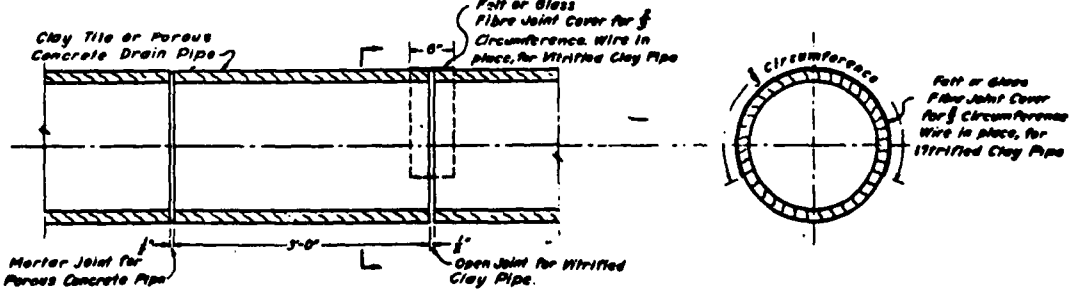
TOE DRAI

Notes
For Location Plan, see Dwg No 45



TOE DRAIN PROFILE

Scale: Horiz. = 1" = 50'-0"
Vert. = 1" = 5'-0"



TOE DRAIN DETAILS

Not to Scale

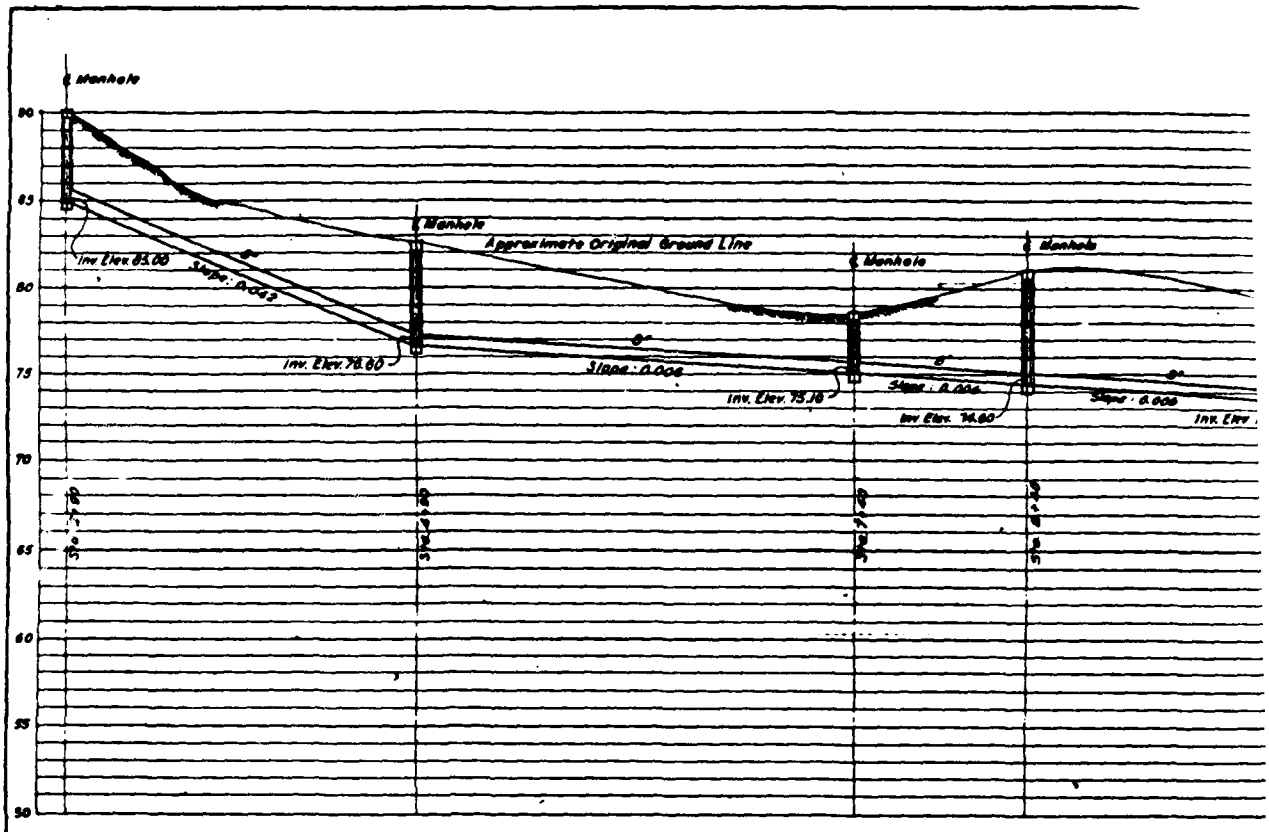
Notes
For Location Plan, see Dwg No 400.15-1.

DRAWING NO. 400.15-10 SV3-1 84 -10

SPRING VALLEY WATER WORKS AND SUPPLY COMPANY
LAKE de FOREST
DAM
TOE DRAIN
PROFILE AND DETAILS
Buck, Seifert and Jost
Consulting Engineers
New York, N.Y.
Scale As shown
May, 1954

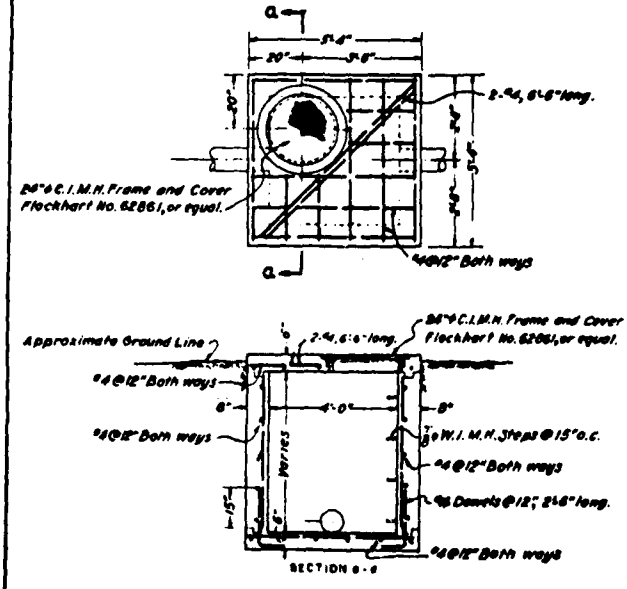
Drawn by: RR	Traced by: GDW	Checked by: DJ	Examined by:	Approved by:
Revisions				

2



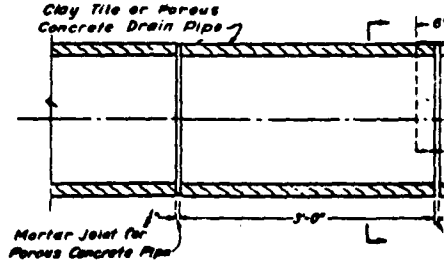
TOE DRAIN PROFILE

Scale: Horiz. = 1"= 50'-0"
Vert. = 1"= 5'-0"



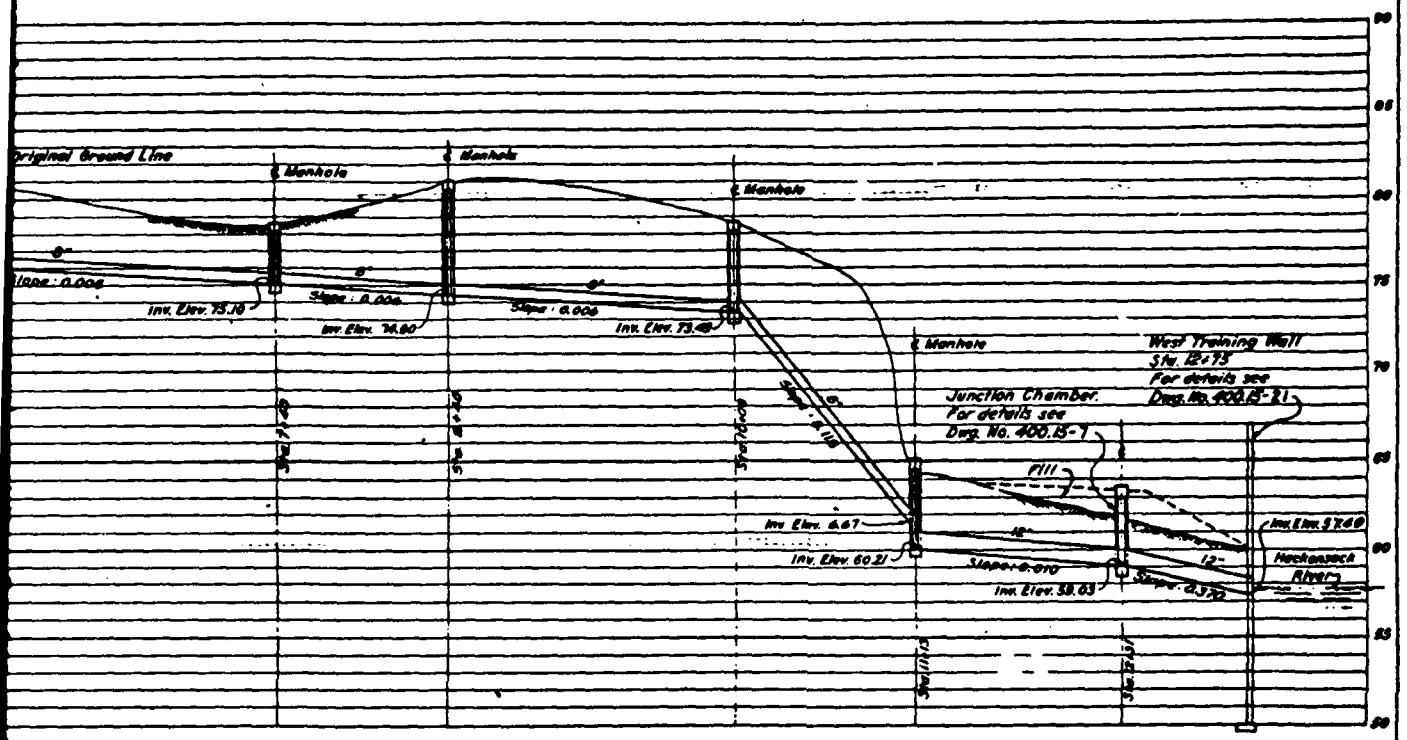
TYPICAL MANHOLE DETAILS

Scale: $\frac{3}{8}$"= 1'-0"



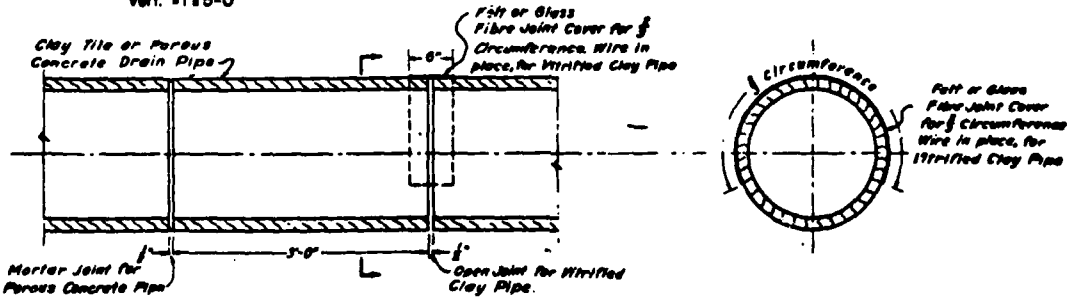
TOE D

Notes
For Location Plan, s



TOE DRAIN PROFILE

Scale: Horiz. = 1" = 50'-0"
Vert. = 1" = 5'-0"



TOE DRAIN DETAILS

Not to Scale

Notes
For Location Plan, see Dwg No 400.15-1

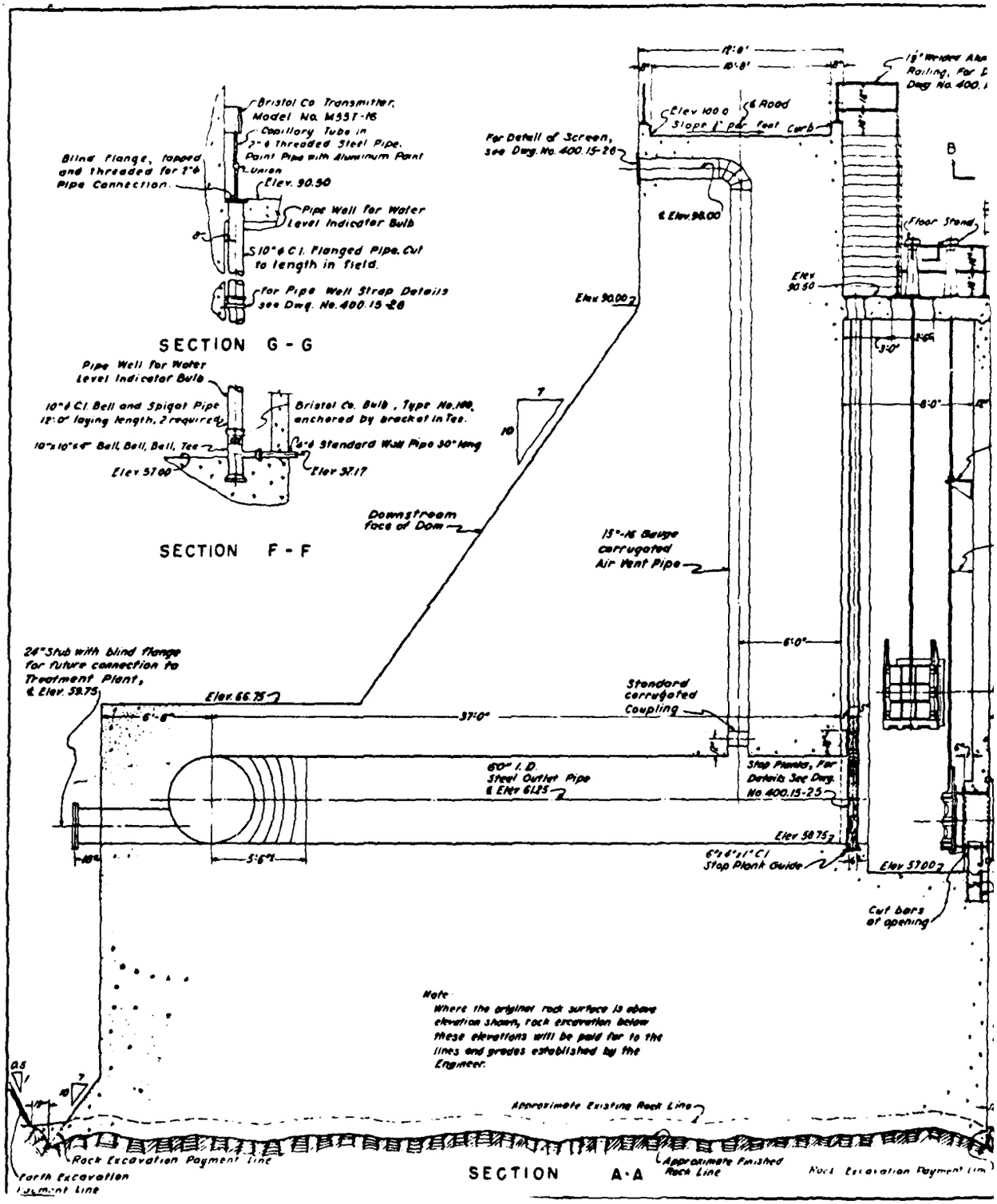
DRAWING NO. 400.15-10 SV3-1 / 54 -10

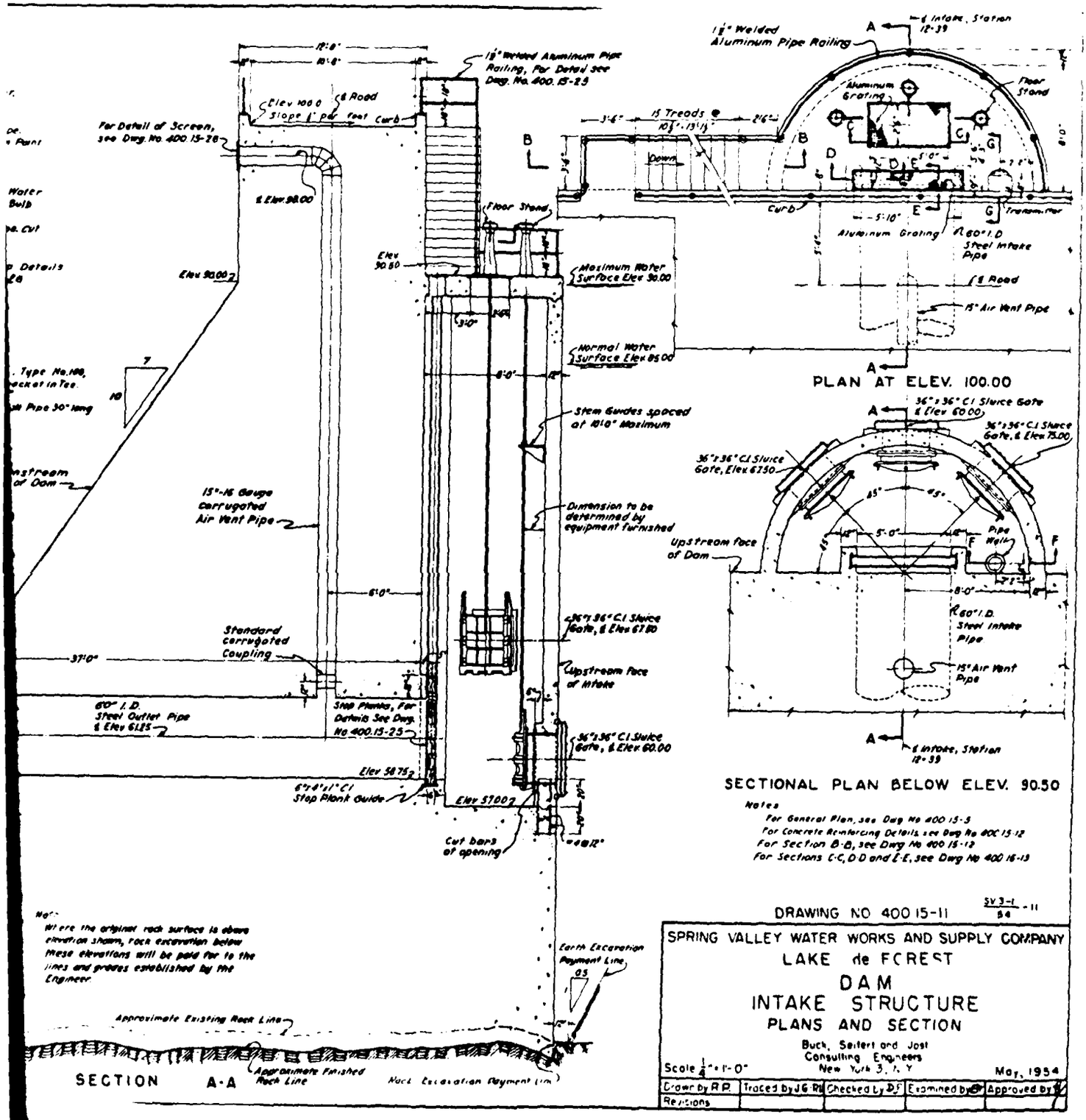
SPRING VALLEY WATER WORKS AND SUPPLY COMPANY
LAKE de FOREST
DAM
TOE DRAIN
PROFILE AND DETAILS
Buck, Seifert and Jost
Consulting Engineers
New York 5, N.Y.
Scale As shown May, 1954

Drawn by: RB	Traced by: GDH	Checked by: DJF	Examined by:	Approved by:
Revisions				

1

2


Bristol Co Transmitter, Model No. M931-16
Capillary Tube in 2"-ø Threaded Steel Pipe, Paint Pipe with Aluminum Paint
Union
Elev. 90.50
Blind Flange, tapped and threaded for 1"ø Pipe Connection.
Pipe Well for Water Level Indicator Bulb
10"ø C.I. Flanged Pipe, Cut to length in field.
For Pipe Well Strap Details see Dwg. No. 400.15-28
SECTION G - G
Pipe Well for Water Level Indicator Bulb
10"ø C.I. Bell and Spigot Pipe 12'-0" laying length, 2 required
Bristol Co. Bulb, Type No. 100, anchored by bracket in Tee.
10"x10"x4" Ball, Ball, Ball, Tee
4"ø Standard Wall Pipe 30" long
Elev 57.00
Elev 57.17
SECTION F - F
Downstream face of Dam
15"-16 Gauge corrugated Air Vent Pipe
24" Stub with blind flange for future connection to Treatment Plant, ℄ Elev. 59.75
Elev. 66.75
Standard corrugated Coupling
60" I.D. Steel Outlet Pipe ℄ Elev 61.25
Stop Planks, For Details See Dwg. No. 400.15-25
Elev 58.75
6"x4"x1/4" C.I. Stop Plank Guide
Elev 57.00
Cut bars at opening
For Detail of Screen, see Dwg. No. 400.15-26
Elev 100.0 ℄ Road Slope 1" per foot Curb
℄ Elev. 98.00
Floor Stand
Elev 90.50
Elev 90.00
Note:
Where the original rock surface is above elevation shown, rock excavation below these elevations will be paid for to the lines and grades established by the Engineer.
Approximate Existing Rock Line
Rock Excavation Payment Line
Earth Excavation Payment Line
Approximate Finished Rock Line
SECTION A-A



Notes

For General Plan, see Dwg No 400 15-3
For Concrete Reinforcing Details see Dwg No 400 15-12
For Section B-B, see Dwg No 400 15-13
For Sections C-C, D-D and E-E, see Dwg No 400 16-13

Note:- Where the original rock surface is above elevation shown, rock excavation below these elevations will be paid for to the lines and grades established by the Engineer.

DRAWING NO 400 15-11 SV 3-1 / 54 - 11

SPRING VALLEY WATER WORKS AND SUPPLY COMPANY
LAKE de FOREST
DAM
INTAKE STRUCTURE
PLANS AND SECTION

Buck, Seifert and Jost
Consulting Engineers
New York 3, N. Y.

Scale ¼" = 1'-0" May, 1954

Drawn by R.P.	Traced by J.G.R.	Checked by D.J.	Examined by	Approved by
Revisions				

1

2

GEOLOGY OF LAKE DE FOREST DAM

I - PHYSIOGRAPHY OF ROCKLAND COUNTY

The Piedmont province and the New England province are sharply defined topographically in Rockland County. The northwestern or highland part of the county is underlain by crystalline rocks of the Reading Prong extension of the New England province. The part of the highland near the New York-New Jersey boundary is the Ramapo Mountains and the part near the Hudson River is the Hudson Highlands. The surface of the upland is rolling and has low relief. The eastern face of the upland is a steep escarpment that overlooks a broad lowland to the east. The bedrock consists chiefly of gently-dipping beds of relatively soft sedimentary rocks that have been eroded to form a series of low, northerly-trending ridges separated by narrow valleys. The eastern slopes of the ridges are steeper than the western slopes. A ridge of diabase rises above the lowland in eastern Rockland County and follows the trend of the Hudson River to Haverstraw where it curves west and terminates several miles from the river. The western slope of the ridge is gentle at some places and steep at others. The streams in Rockland County are tributary to the Hudson,Hackensack, and Passaic Rivers. The Hackensack River drains an area of about 48 square miles in eastern Rockland County. The discharge from the northern part of the watershed drains into Lake de Forest Reservoir which is controlled by the Lake de Forest Dam at West Nyack. The reservoir is about four miles long, 0.25 to 0.5 mileswide, and has an area of about 1,020 acres. The storage capacity is about 5.6 billion gallons at a water surface of 85 feet above mean sea level. The maximum depth of water in the reservoir at full capacity is about 20 feet. The New York State Water Power and Control Commission requires release of sufficient water at the dam to maintain a discharge equivalent to 9.75 MGD in the stream immediately above the intake works of the village of Nyack at West Nyack.

II - GENERAL GEOLOGY

The Lake de Forest area is underlain by sedimentary and igneous rocks of Triassic age (the Newark group) which are covered by deposits of the Pleistocene and recent epochs. The eastern boundary of the Newark group terminates beneath the Hudson River in Westchester County. The constituent shale and siltstone form lowlands in the eastern part of the basin. In some places sandstone and shale occur in alternating beds from about 2 to 20 feet thick. The strike of the beds of the Newark group ranges from north to N.45°E. and the dip is westerly, ranging from 4° to 20°. Faults have been reported in the Newark group at Upper Nyack and at Stony Point. Cross faults in the Palisade diabase extend for some distance into the adjoining rocks of the Newark group. The Newark group is the principal source of ground water in the county It is well-cemented generally and most of the water occurs in openings along bedding planes, joints, and irregular fractures. Such openings are as much as 0.5 to 1.5 feet wide.

A) GEOLOGIC HISTORY

Near the end of the Triassic boundary, the Palisade diabase was intruded into the sedimentary rocks in eastern Rockland County. At the close of the period, the Triassic rocks probably were broken into a series of blocks by northeast-trending faults. During the Pleistocene epoch, glaciers moved south across the county several times. The ice sheets eroded the surface of the bedrock and during melting stages, they deposited an unsorted mixture of clay, sand, gravel, and boulders (till). Streams flowing from the ice sheet deposited stratified material in the larger valleys. During the melting stage of the last ice sheet large lakes occupied parts of the Hackensack and Hudson River valleys. Thick deposits of clay and silt were laid down in these lakes along with layers of sand and gravel. Among the valleys that were deepened by glacial streams were those of the Hackensack and Hudson Rivers. The deepest point on the bedrock surface in the Hackensack valley is about 55 feet below sea level. Several abandoned channels have been filled with these glacial deposits.

B) STRUCTURAL GEOLOGY

The bedrock of Rockland County has been subjected to folding, faulting, and igneous intrusions. The crystalline rocks of Precambrian age and the adjoining belt of Paleozoic rocks are highly deformed and so closely folded that limbs of the folds are nearly vertical in many places. The general trend of the rock is northeasterly. Normal and reverse faults are common. Differential erosion in the Triassic basin has produced a series of parallel strike ridges and valleys on the surface of the northeast-trending beds. Changes in the strike of the beds in a few places imply the presence of faults. In the eastern part of the county the Palisade diabase cuts across the Triassic beds as dikes or sills with prominent joints perpendicular to their moraines. At its northern limit the trend of the diabase ridge is almost due west and nearly perpendicular to the regional strike of the sedimentary rocks. The diabase ridge is cut by a series of faults, mostly of the normal type, and are seen as notches. The shattered condition of the diabase and the irregular configuration of its outcrop near Nyack suggest faults in the diabase. The steep back slope of the diabase ridge in several places is due to longitudinal faulting.

C) UNCONSOLIDATED DEPOSITS

The bedrock is covered by unconsolidated deposits of Pleistocene and Recent age except in scattered areas chiefly on hills. The deposits of Pleistocene age were laid down chiefly during the last glaciation (the Wisconsin stage), and are classified as till and stratified drift. The deposits of Recent age have generally low permeability. Till (or hardpan) is generally the uppermost unconsolidated deposit. In the eastern part of the county till deposited on the Newark group contains much locally-derived sandstone and shale and is red-brown. Generally, the deposits are less than 25 feet thick. Most of the stratified drift was deposited during the retreat of the ice when isolated masses of ice occupied large depressions such as the Hudson, Hackensack, and Ramapo valleys. Deposits of reddish-brown varved clay and silt in the Hackensack River valley are as much as 30 feet thick.

III - VISUAL DESCRIPTION OF THE PROPOSED DAM SITE FROM REPORT MADE IN 1951 BY KELLY GEOPHYSICAL SERVICES

The west abutment at the proposed dam site consists of a small hill lying between the swampy land through which the Hackensack River runs on the east, and a higher and slightly less swampy area on the west. The hill has a steep easterly face and a gentle westerly slope. At its summit there are outcrops of Palisades diabase which occur as sills injected between the beds of shale. The gentle, westerly slope of this hill is close to the dip slope of the underlying rock; the steep, easterly scarp would therefore cut across the sill and bedding of the underlying shales. Geophysical observations suggest that a dam built at the proposed location would probably have shale bedrock underlying it on the east abutment. The west abutment would be against igneous material and metamorphosed shales. The dike would run for most of its length on the igneous and metamorphic material, but for a short distance after it swings westerly towards the Strawtown Road, the bedrock would be predominantly shale. Approaching the rise in ground towards the Strawtown Road, the bedrock again becomes shales, and igneous close to the road. This igneous rock rock may be at a stratigraphically higher level than that capping the hill to the northeast. The spillway would be in igneous and metamorphosed material at the higher elevation, and in shaley material at the lower elevation, near the point of confluence with the river. The underlying shales may carry minor intrusions and fingers of igneous rock. The overburden is mainly an alluvial deposit. On the higher ground, in the orchard and field west of the Hackensack River, it is silty and does not contain much sand. In the swamp east of the hill, through which the Hackensack River meanders, the overburden is mostly clay. Sandy material may be encountered in the overburden under the alignment of the dike. In some areas, a minor, buried channel may underlie part of the dike and because of the sandy filling, furnish a passageway for infiltrating water.

HYDRAULIC/HYDROLOGIC COMPUTATIONS

APPENDIX II

LAKE DE FOREST DAM

HACKENSACK R. AT W. NYACK D.A. = 29.4 SQ.MI.

- FLOW REGULATED BY DE FOREST LAKE.
- DISCHARGE GIVEN FOR THIS GAGE REPRESENTS THE FLOW OF THE HACKENSACK R. DOWNSTREAM OF WATER SUPPLY DIVERSION FOR NYACK.

PASCACK BROOK AT WESTWOOD D.A. = 29.6 SQ. MI.

$T_c = 14.83$

$R = 6.88$

CLARK PARAMETERS FOR HACKENSACK R. AT DAM:

$$\left(\frac{26.6}{29.6}\right)^{0.25} \times T_c = 14.43$$

$$\left(\frac{26.6}{29.6}\right)^{0.25} \times R = 6.70$$

* GAGE RECORDS FROM PASCACK BROOK WERE RELIABLE. THE UNIT HYDROGRAPH WAS WELL DEFINED. OPTIMIZATION OF THE UNIT HYDROGRAPH PARAMETERS (CLARK'S) YIELDED $T_c = 14.83$ $R = 6.88$. RECORDS FROM THE WEST NYACK GAGE (1 MILE DOWNSTREAM OF DE FOREST LAKE DAM) WERE NOT REPRESENTATIVE OF THE BASIN DUE TO THE REGULATING EFFECT OF THE RESERVOIR AND DIVERSION. INVESTIGATION OF THE TWO BASINS (PASCACK BK. AND HACKENSACK R. AT DAM) REVEALED PHYSICAL SIMILARITY. THEREFORE THE HYDROLOGIC FEATURES WERE CONSIDERED PROPORTIONATE FOR THE SAME SIZE BASIN. BECAUSE OF THE DIFFERENCE IN DRAINAGE AREA, A RATIO OF THE TWO BASINS WAS USED TO FIX THE UNIT HYDROGRAPH PARAMETERS FOR THE HACKENSACK R. AT DE FOREST LAKE.

DE FOREST LAKE DAM:

DRAINAGE AREA - 26.6 mi²

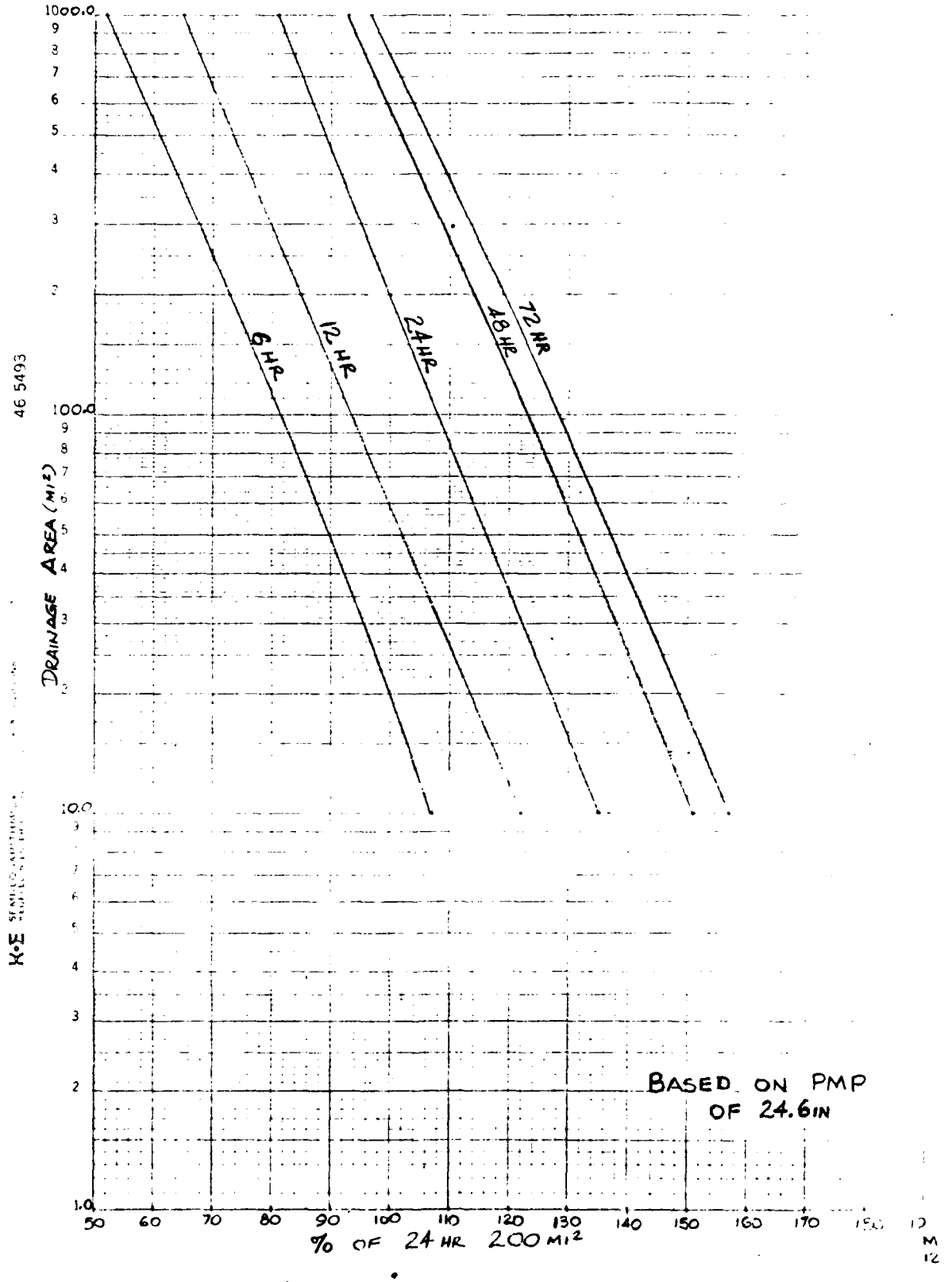
DEPTH	DURATION	D.A.	% of [illegible] - 200 mi²
26.2	6HR	10	107
30.0	12	10	122
33.2	24	10	135
37.1	48	10	151
38.6	72	10	157
17 9	6	200	73
21.0	12	200	85
24.6	24	200	100
28.0	48	200	114
29.2	72	200	119
12.7	6	1000	52
16.0	12	1000	65
19.9	24	1000	81
23.0	48	1000	93
23.8	72	1000	97

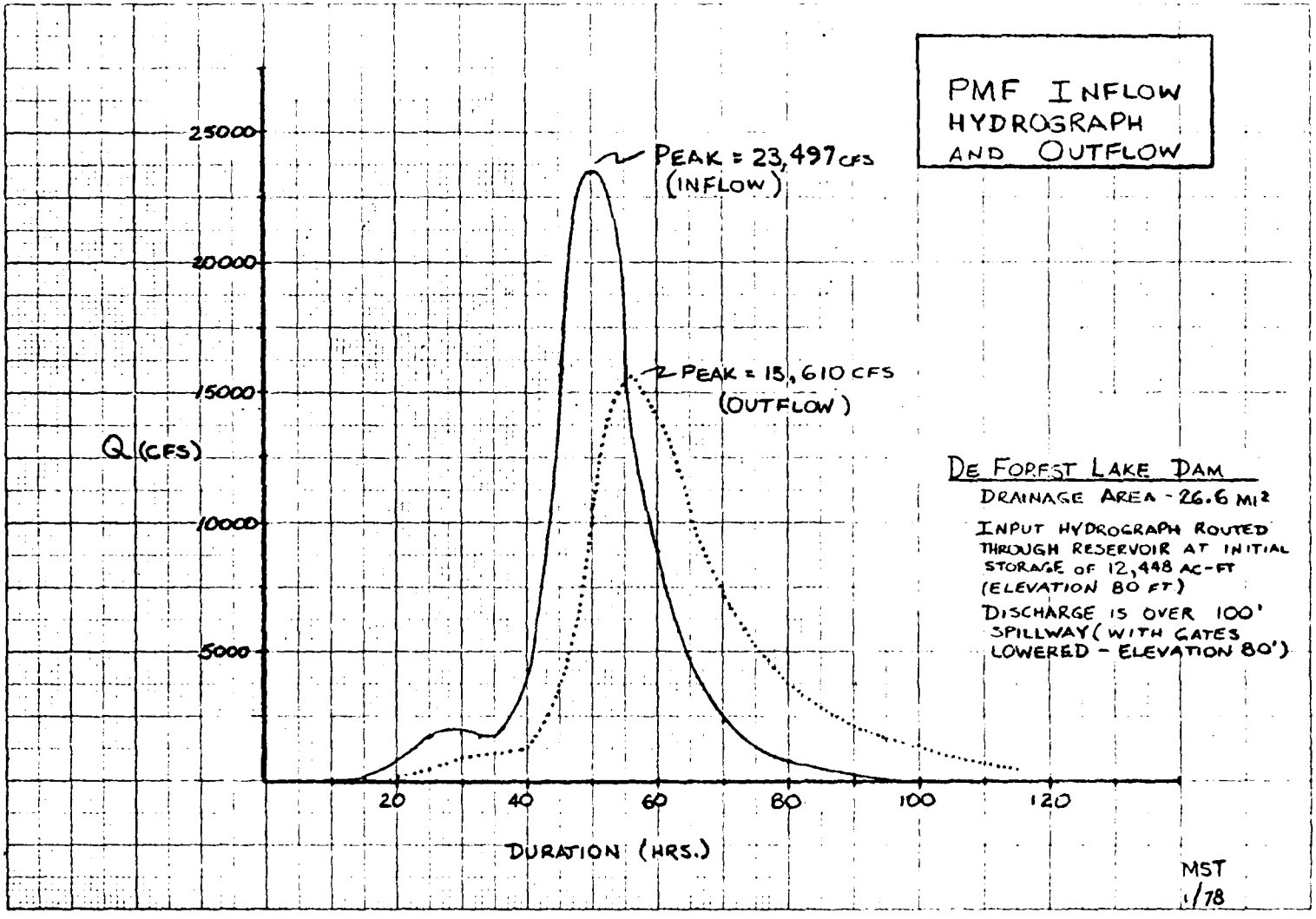
RATIOS

6HR	97
12HR	110
24HR	123
48 HR	139
72HR	145

PMP 24.6 IN FOR 24 HR - 200 mi²

MST
12/22/7[illegible] 1


1000.0
9
8
7
6
5
4
3
2
100.0
9
8
7
6
5
4
3
2
10.0
9
7
6
5
4
3
2
1.0
DRAINAGE AREA (MI²)
6 HR
12 HR
24 HR
48 HR
72 HR
BASED ON PMP
OF 24.6 IN
50
60
70
80
90
100
110
120
130
140
150
160
170
% OF 24 HR 200 MI²
46 5493
K·E


PMF INFLOW HYDROGRAPH AND OUTFLOW
PEAK = 23,497 CFS (INFLOW)
PEAK = 15,610 CFS (OUTFLOW)
Q (CFS)
25000
20000
15000
10000
5000
20
40
60
80
100
120
DURATION (HRS.)
DE FOREST LAKE DAM
DRAINAGE AREA - 26.6 MI²
INPUT HYDROGRAPH ROUTED THROUGH RESERVOIR AT INITIAL STORAGE OF 12,448 AC-FT (ELEVATION 80 FT)
DISCHARGE IS OVER 100' SPILLWAY (WITH GATES LOWERED - ELEVATION 80')
MST
/78

HOWELL - BUNGER OUTLET CAPACITY

12" ϕ CONDUIT

$R = A/W.P.$
$= .785/3.14$
$= .25$

$\eta = 0.015$

$k_g = 2gL / \frac{2.2082}{\eta^2} R^{4/3}$
$= 64.4(\sim 56)/9814\ (.158)$
$= 3596/1546$
$= 2.34$

$K_T = k_g + k_{ENT} + k_{EXIT}$
$= 2.34 + (1.5\ \text{ASSUMED})$
$= 3.84$

$C = \sqrt{1/K_T}$
$= \sqrt{1/3.84}$
$= .51$

$Q = c A \sqrt{2gH}$

ELEVATION	Q
85	15.6
86	16.0
87	16.3
88	16.6
90	17.2
92	17.8
94	18.4
96	18.9
98	19.5
100	20.0

24" ϕ CONDUIT

$R = A/W.P.$
$= 3.14/6.28$
$= .5$

$\eta = 0.015$

$k_g = 2gL / \frac{2.2082}{\eta^2} R^{4/3}$
$= 64.4(\sim 56)/9814\ (.397$
$= 3596/3896$
$= .93$

$K_T = k_g + k_{ENT} + k_{EXIT}$
$= .93 + 1.5\ (\text{ASSUMED})$
$= 2.43$

$C = \sqrt{1/K_T}$
$= \sqrt{1/2.43}$
$= .64$

$Q = c A \sqrt{2gH}$

ELEVATION	Q
85	78.6
86	80.4
87	81.9
88	83.4
90	86.5
92	89.5
94	92.3
96	95.1
98	97.8
100	100.4

MST
1/78

OUTLET DISCHARGE CAPACITIES

WARM WATER OUTLET

$$Q = CA\sqrt{2gH}$$

$$R = A / W.P.$$
$$= 9 / 12$$
$$= 0.75$$

$$\eta = 0.015$$

$$k_g = 2gL / \frac{2.2082}{\eta^2} R^{4/3}$$
$$= 64.4(45') / 9814\ (.563)$$
$$= 5.25$$

$$k_T = k_g + k_{ENT} + k_{EXIT}$$
$$= 5.25 + 1.5$$
$$= 6.75$$

$$C = \sqrt{1/k_T}$$
$$= \sqrt{1/6.75}$$
$$= .385$$

$$Q = .385(9)\sqrt{2(32.2)\ 10}$$
$$= \underline{88\ CFS}$$

MST
1/78

LOW POOL OUTLET

$$Q = CA\sqrt{2gH}$$

$$R = A/W.P.$$
$$= 9/12$$
$$= 0.75$$

$$\eta = 0.015$$

$$k_g = 2gL \Big/ \frac{2.2082}{\eta^2} R^{4/3}$$
$$= 64.4(45)/9814(.563)$$
$$= 5.25$$

$$k_T = k_g + k_{ENT} + k_{EXIT}$$
$$= 5.25 + 1.5$$
$$= 6.75$$

$$C = \sqrt{1/k_T}$$
$$= \sqrt{1/6.75}$$
$$= .385$$

$$Q = .385(9)\sqrt{2(32.2)25}$$
$$= \underline{139 \text{ CFS}}$$

MST
1/78

DIVERSION TUNNEL OUTLET

$$Q = cA\sqrt{2gH}$$

$R = A / W.P.$
$= 19.63 / 15.7$
$= 1.25$

$\eta = 0.015$

$$K_g = 2gL \Big/ \frac{2.2082}{\eta^2} R^{4/3}$$

$= 64.4\,(37) \Big/ \frac{2.2082}{\eta^2} (1.35)$
$= 2383 / 9814\,(1.35)$
$= .18$

$K_T = K_g + K_{ENT} + K_{EXIT}$
$= .18 + 1.5$
$= 1.68$

$C = \sqrt{1/K_T}$
$= \sqrt{1/1.68}$
$= .77$

$Q = .77\,(19.63)\sqrt{2\,(32.2)(23.75)}$

$= \underline{591 \text{ CFS}}$

MST
1/78

DE FOREST LAKE DAM

EL VS CAPACITY CURVE 1 ac = 3.06 AC-FT

EL. FT. M.S.L.	CAPACITY (M.G.)	CAPACITY (ACRE-FT.)	SPILLWAY CREST AT 85 FT 100 FT. LONG DISCHARGE C=3.2
80 ✓	4068	12448	0
85 ✓	5638 1025 ACRES	17252	3578
86 ✓	5991	18332	4704
87	6394	19413	5926
EXTRAPOLATED 88		20,500	7242
90		22,682	10118
92		24,900	13302
94		27,200	16762
96		29,600	20480
98		32,300	24438
100		36,362 ACRE-FT.	28622

59.3 / 5 = 11.86 ; 67.5 / 5 = 13.5 ; 8.63 ; 9.95 ; 17.3 x .1939 = 2.98 SQ. MI = 1588 ACRES

.1939 SQ. MI = 124.096 ACRES

AVG 90 → 100 = 1368 ACRES x 10 = 13680 ACRE-FT

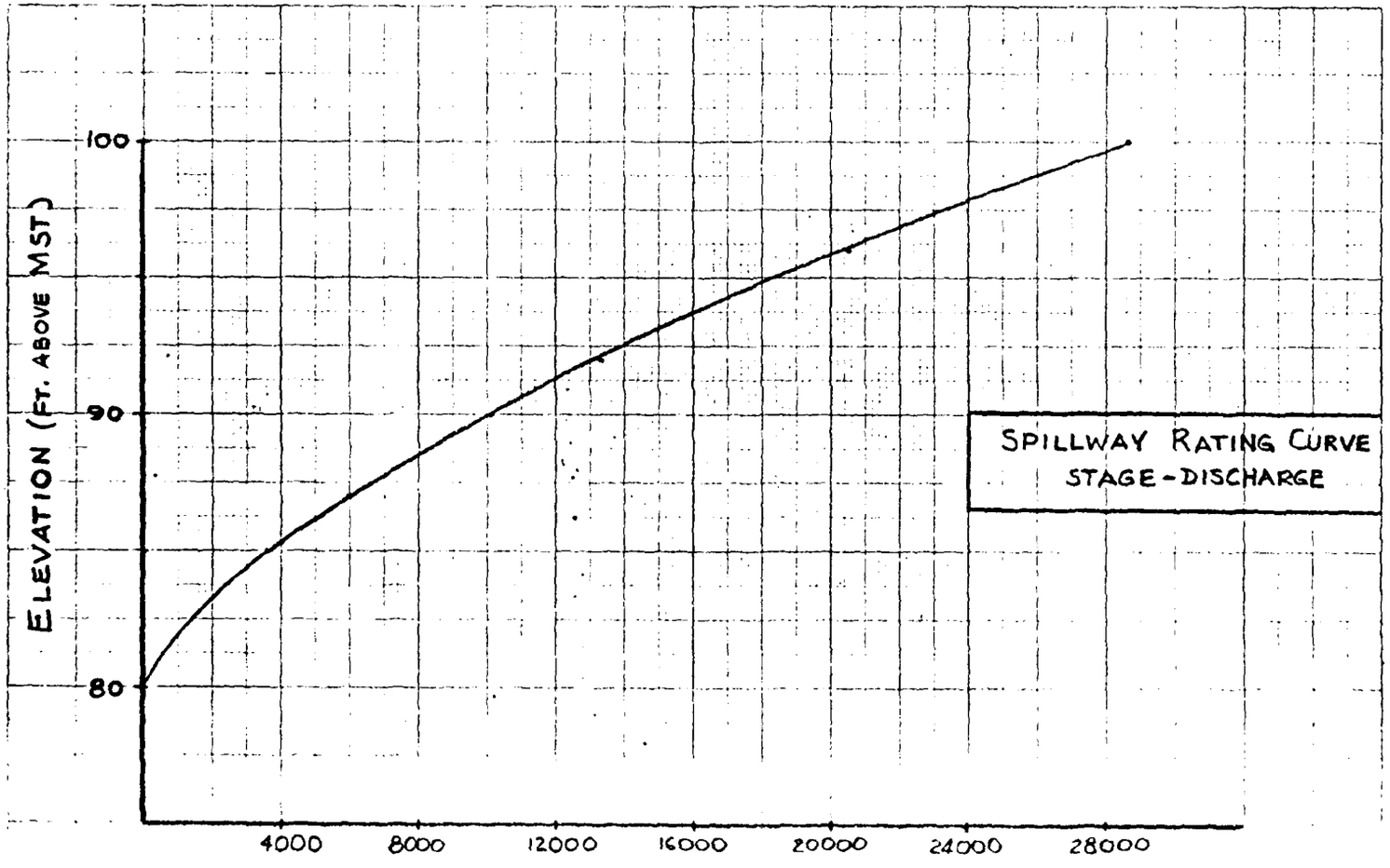
AVG 85' TO 90' = 1025 ACRES x 5 = 5493 AC-FT

USE C = 3.2 = COEFFICIENT OF DISCHARGE $Q = C L H^{3/2}$

$= 3.2 H^{3/2}$

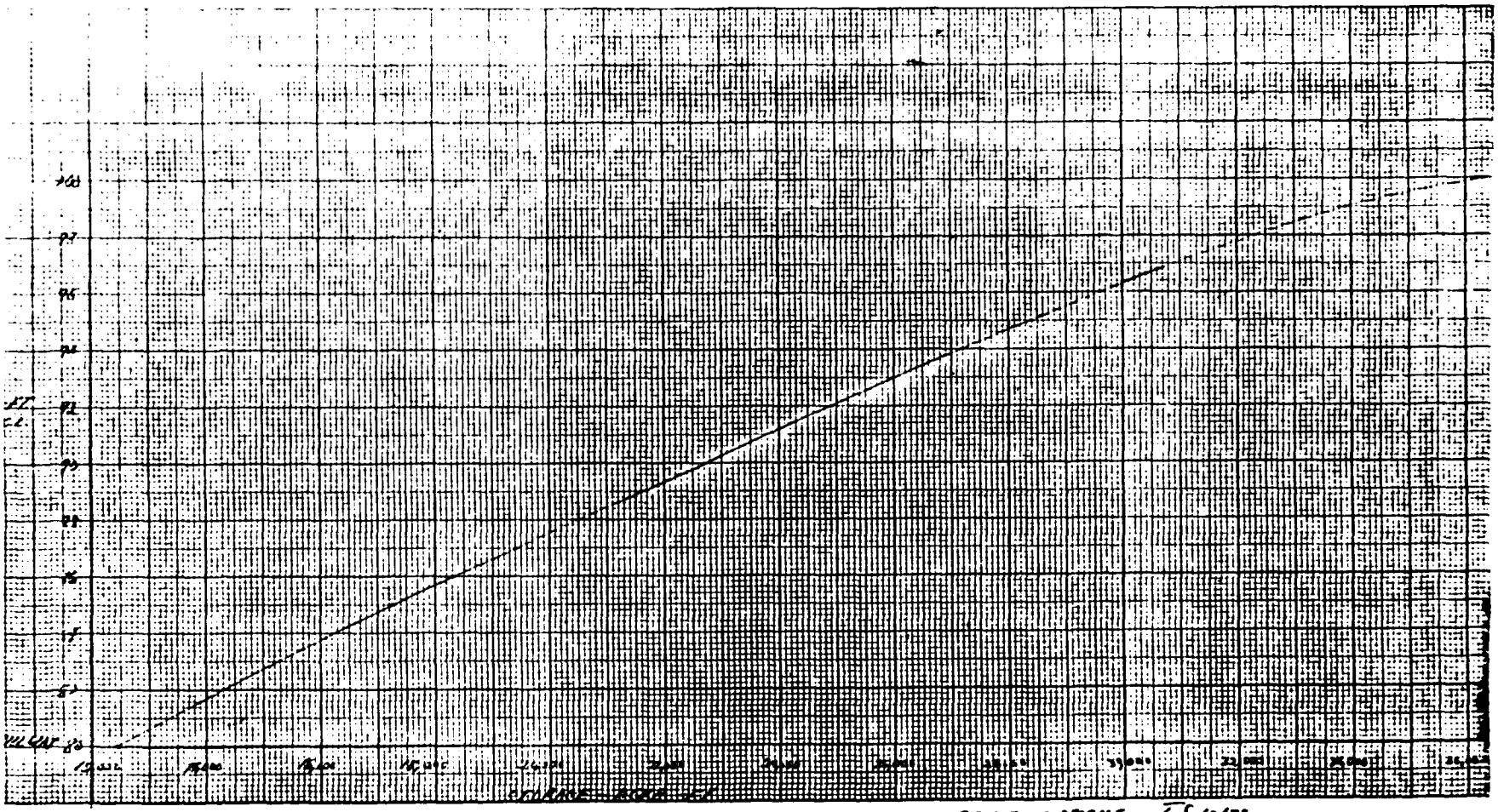
EL. FT. M.S.L.	HEAD	$H^{3/2}$	$Q = CLH^{3/2}$ = C.F.S.
85	5	11.18	3578
86	6	14.70	4704
87	7	18.52	5926
88	8	22.63	7242
90	10	31.62	10118
92	12	91.57	13302
94	14	52.38	16762
96	16	64	20480
100	20	89.44	28622
98	18	76	24438

61.25' 24"


ELEVATION (FT. ABOVE MST)
100
90
80
4000
8000
12000
16000
20000
24000
28000
DISCHARGE (CFS)
SPILLWAY RATING CURVE
STAGE - DISCHARGE

MST
1/78

46 1242



STAGE VS STORAGE T.S. 10/77
OF FOREST LAKE

COMPUTER PRINTOUT

ROUTING OF PMF

HEC-1 VERSION ... JAN 1973
UPDATED AUG 74

DEFOREST LAKE DAM ON MACKENBACK RIVER
FLOOD ROUTING - 100 FT WIDE SPILLWAY
P M F

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
116	1	0	0 0	0	0	0	2	0	0

JOPER	NWT
3	0

SUB-AREA RUNOFF COMPUTATION

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
0	0	0	0	0	0	0

HYDROGRAPH DATA

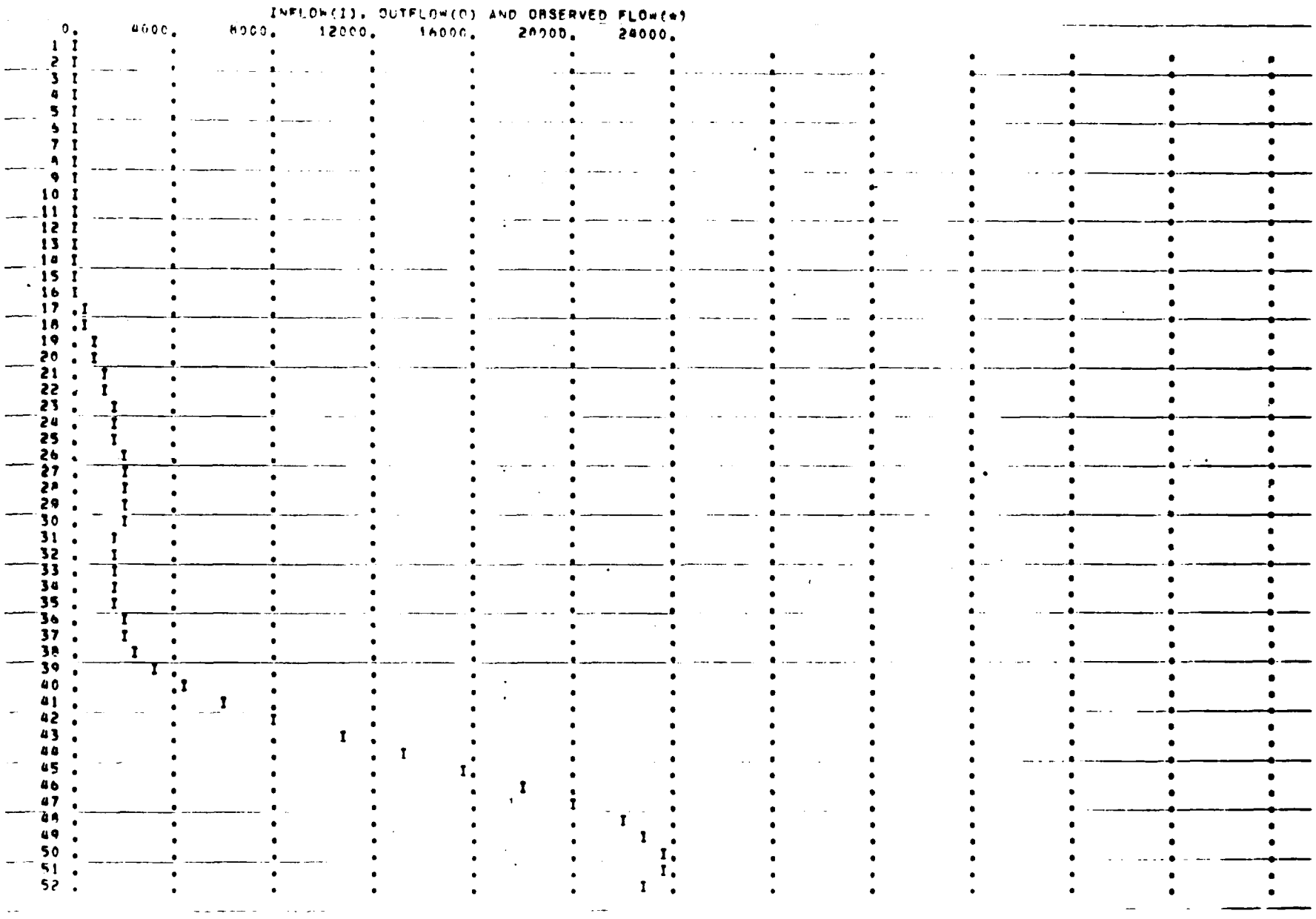
IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
-1	0	24.60	0.	0.	0.	0.	0	0	0

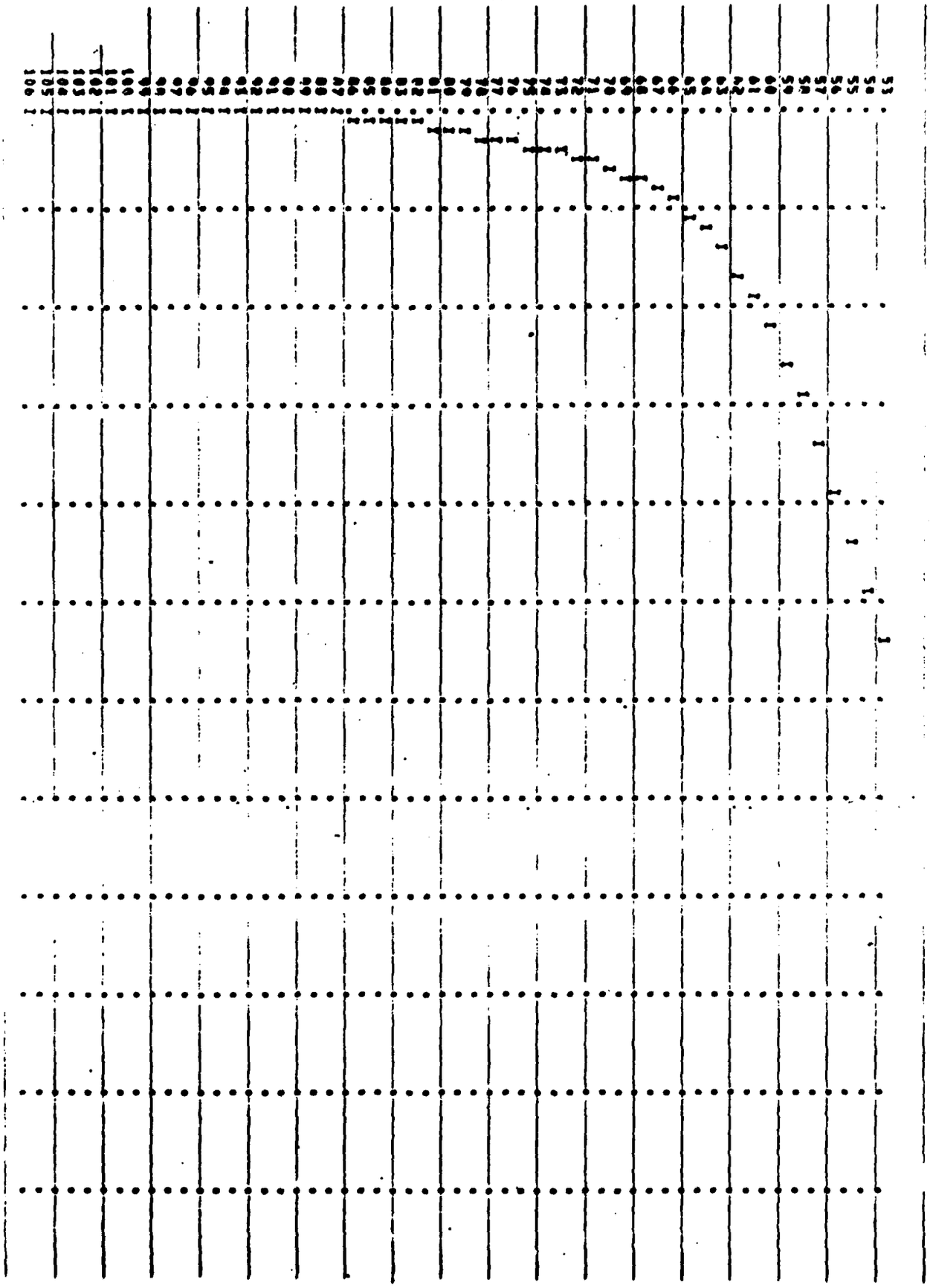
INPUT HYDROGRAPH

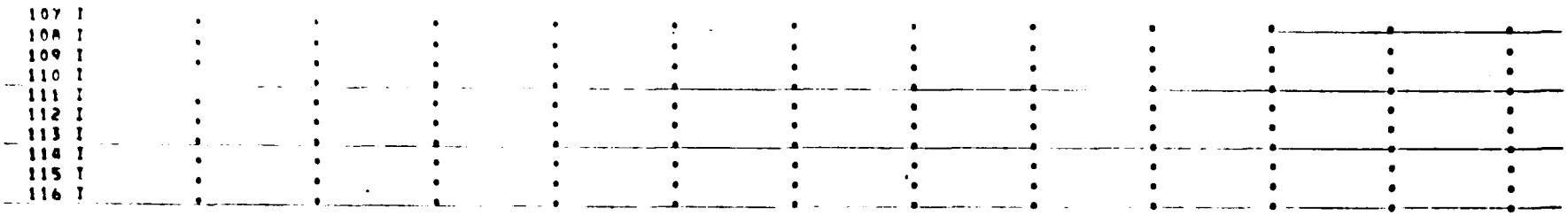
53.	53.	53.	53.	53.	53.	53.	53.	53.	53.
53.	53.	53.	54.	65.	120.	237.	495.	604.	821.
1044.	1268.	1479.	1657.	1790.	1881.	1930.	1939.	1902.	1811.
1694.	1612.	1581.	1610.	1700.	1848.	2085.	2509.	3191.	4324.
6023.	8176.	10402.	13144.	15655.	18020.	20125.	21880.	22939.	23497.
23483.	22781.	21557.	19787.	17679.	15544.	13560.	11797.	10250.	8884.
7679.	6629.	5717.	4948.	4301.	3760.	3305.	2928.	2610.	2341.
2117.	1918.	1744.	1584.	1435.	1294.	1157.	1018.	889.	767.
663.	561.	470.	384.	287.	212.	170.	152.	137.	123.
112.	102.	94.	88.	83.	79.	75.	72.	70.	67.
65.	64.	62.	61.	60.	59.	58.	57.	56.	55.
55.	55.	53.	53.	53.	53.				

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23497.	22670.	14593.	5933.	430146.
INCHES		7.93	20.81	28.90	25.97
AC-FT		11267.	29060.	39328.	35568.

STATION 0


INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0.
4000.
8000.
12000.
16000.
20000.
24000.





********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
0	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.	0.	0.	11	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISTOR
1	0	0	0.	0.	0.	12448.	1

STORAGE = 12448.00 17252.00 18332.00 19413.00 20500.00 22682.00 24900.00 27200.00 29600.00 32300.00

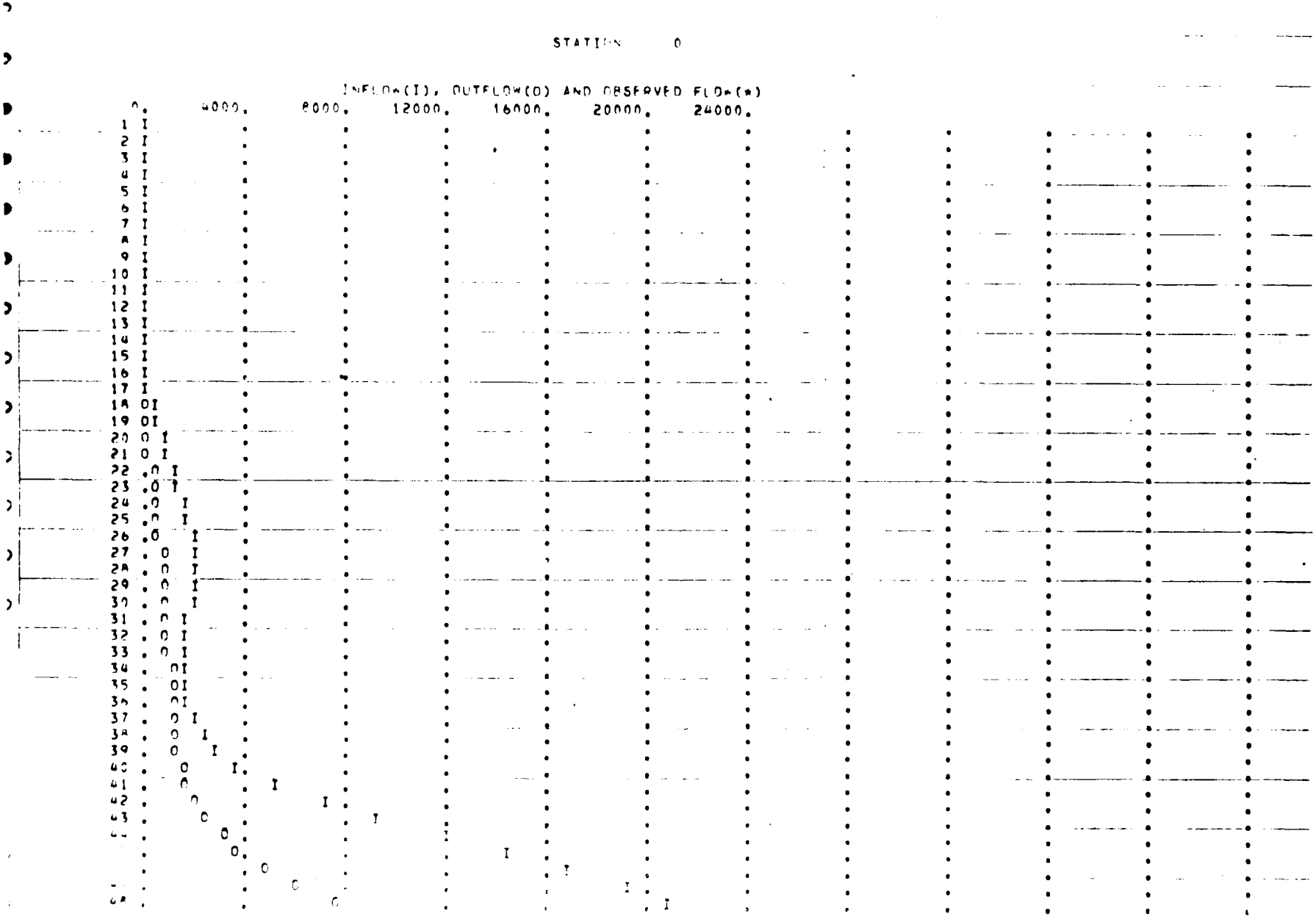
STORAGE = 36362.00

OUTFLOW = 0. 3578.00 4704.00 5926.00 7242.00 10118.00 13302.00 16762.00 20480.00 24438.00

OUTFLOW = 28622.00

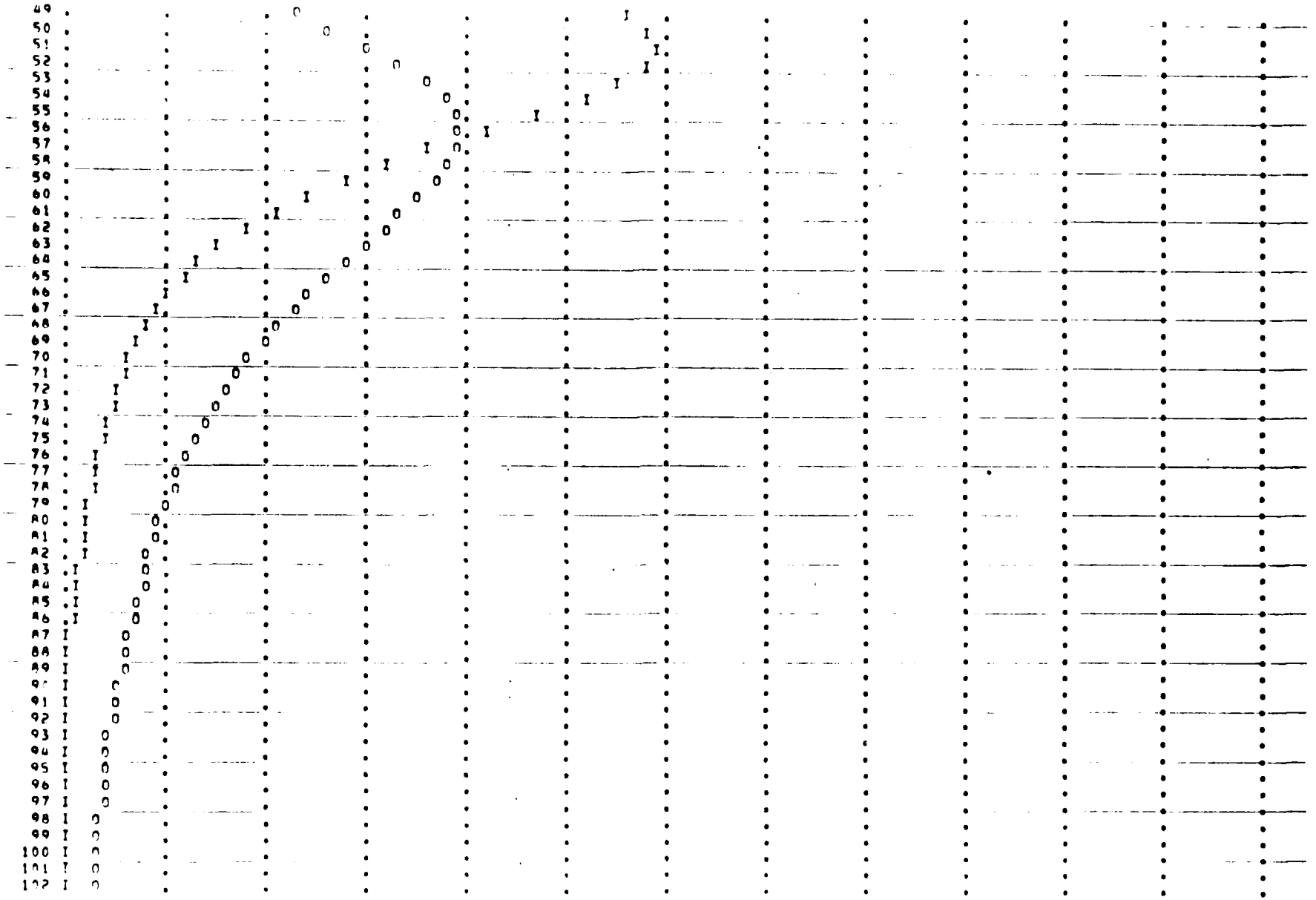
TIME	EOP STOR	AVG IN	EOP OUT
1	12452.	53.	3.
2	12456.	53.	6.
3	12460.	53.	9.
4	12464.	53.	12.
5	12467.	53.	14.
6	12470.	53.	16.
7	12473.	53.	19.
8	12476.	53.	21.
9	12478.	53.	23.
10	12481.	53.	24.
11	12483.	53.	26.
12	12485.	53.	28.
13	12487.	53.	29.
14	12489.	54.	31.
15	12491.	60.	32.
16	12496.	93.	36.
17	12508.	179.	44.
18	12530.	321.	61.
19	12565.	505.	87.

20	12616.	713.	125.
21	12640.	933.	173.
22	12759.	1156.	232.
23	12851.	1374.	300.
24	12952.	1568.	376.
25	13060.	1728.	456.
26	13171.	1836.	538.
27	13281.	1904.	620.
28	13386.	1935.	699.
29	13488.	1921.	772.
30	13571.	1857.	836.
31	13645.	1755.	891.
32	13706.	1655.	937.
33	13759.	1587.	976.
34	13808.	1596.	1013.
35	13860.	1655.	1052.
36	13918.	1772.	1095.
37	13987.	1965.	1146.
38	14080.	2207.	1215.
39	14211.	2850.	1313.
40	14407.	3758.	1459.
41	14704.	5174.	1681.
42	15139.	7100.	2004.
43	15731.	9389.	2445.
44	16487.	11873.	3008.
45	17399.	14400.	3731.
46	18437.	16838.	4622.
47	19541.	19073.	6106.
48	20730.	20963.	7545.
49	21892.	22370.	9076.
50	22998.	23218.	10572.
51	24005.	23470.	12017.
52	24870.	23112.	13250.
53	25564.	22169.	14300.
54	26059.	20672.	15046.
55	26346.	18733.	15478.
56	26436.	16612.	15618.
57	26352.	14552.	15487.
58	26134.	12679.	15150.
59	25812.	11024.	14674.
60	25415.	9547.	14076.
61	24984.	8242.	13398.
62	24477.	7154.	12694.
63	23968.	6173.	11964.
64	23451.	5333.	11221.
65	22934.	4625.	10483.
66	22431.	4031.	9788.
67	21941.	3533.	9142.
68	21469.	3117.	8519.
69	21018.	2769.	7925.
70	20591.	2476.	7362.
71	20188.	2229.	6868.
72	19806.	2018.	6402.
73	19446.	1831.	5966.


STATION 0
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0.
4000.
8000.
12000.
16000.
20000.
24000.

74	19107.	1650.	5580.
75	18785.	1510.	5217.
76	18481.	1365.	4873.
77	18193.	1226.	4559.
78	17918.	1088.	4272.
79	17655.	954.	3998.
80	17404.	828.	3736.
81	17163.	715.	3512.
82	16931.	612.	3339.
83	16704.	516.	3170.
84	16484.	427.	3006.
85	16269.	326.	2846.
86	16060.	240.	2691.
87	15860.	191.	2541.
88	15669.	161.	2399.
89	15488.	145.	2265.
90	15317.	130.	2137.
91	15155.	118.	2016.
92	15002.	107.	1902.
93	14858.	98.	1795.
94	14721.	91.	1693.
95	14592.	86.	1597.
96	14471.	81.	1506.
97	14356.	77.	1421.
98	14248.	74.	1341.
99	14146.	71.	1265.
100	14050.	69.	1193.
101	13960.	66.	1126.
102	13875.	65.	1063.
103	13795.	63.	1003.
104	13719.	62.	947.
105	13648.	61.	894.
106	13581.	60.	844.
107	13518.	59.	797.
108	13459.	58.	753.
109	13403.	56.	711.
110	13350.	54.	672.
111	13301.	53.	635.
112	13254.	53.	600.
113	13210.	53.	568.
114	13169.	53.	537.
115	13130.	53.	508.
116	13094.	53.	481.
SUM			422575.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	15610.	15242.	11736.	5654.	422575.
INCHES		5.33	16.42	23.73	24.63
AC-FT		7562.	23290.	33662.	34942.



```
105 I O
106 I O
107 I O
108 I O
109 I O
110 I O
111 I O
112 I O
113 IO
114 IO
115 IO
116 IO
1
1          **********      **********      **********      **********      **********
```

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	0	23497.	22670.	14593.	5933.	26.60
ROUTED TO	0	15610.	15242.	11736.	5654.	26.60

```
 STOP
F-0175 E MECISS-FHC/COE    RECOVERED FROM OBSOLETE DUMP
WALKBACK SEQUENCE
PROGRAM  ENTRY   LINE    ADDRESS  CALLER   LINE    ADDRESS
SFIO     SFIO            015167   NORMAL   270.    050585
SNOOP    NORMAL  99.                FSTOPS           006773
FSTOPS   FSTOPS          010571            108.    001520
????PS                   024723   MANE2    427.    035304
MANE2    MANE2   1.      036015            411.    003433
RECURSIVE OR EXCESSIVE SUBROUTINE NEST
```

Check List
Visual Inspection
Phase 1

Name Dam LAKE DE FOREST DAM County ROCKLAND State NEW YORK ID # 95

Type of Dam EARTHEN DAM W/ CONCRETE SPILLWAY Hazard Category 1

Date(s) Inspection 14 DEC 77 Weather RAIN Temperature 40°F

Pool Elevation at Time of Inspection _____ M.S.L. Tailwater at Time of Inspection _____ M.S.L.

Inspection Personnel:

CASPE F&M KESSENIDES MECH. KOCH NYSDEC

DIGUARDI F&M SMYTH HYDRAULICS IARROBINO NAD

MANDELL STRUCTURAL

JEROME CASPE Recorder

APPENDIX III

CONCRETE/~~MASONRY~~ DAMS

ITEM	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	SLIGHT SEEPAGE OBSERVED IN SPILLWAY JOINT DRAINS	V-NOTCH WEIR TO MONITOR FLOW
STRUCTURE TO ABUTMENT/EMBANKMENT, JUNCTIONS	GOOD - NO DISTRESS NOTED	
DRAINS	CONSTRUCTION JOINT DRAINS IN SPILLWAY - "SEE ABOVE"	
WATER PASSAGES	NO BLOCKAGES	
FOUNDATION	O.K.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBERSVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	NONE	
STRUCTURAL CRACKING	NONE	
VERTICAL AND HORIZONTAL ALIGNMENT	NO VARIATION NOTICED	
MONOLITH JOINTS		
CONSTRUCTION JOINTS	SLIGHT SEEPAGE IN JOINT DRAIN SYSTEM	
STAFF GAGE OR RECORDER;		

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIO
SURFACE CRACKS	NONE - CREST ROADWAY SURFACE IN GOOD CONDITION	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	NONE	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	VERY GOOD	
RIPRAP FAILURES	NONE, HOWEVER BRUSH AND SMALL TREES ARE GROWING UNCONTROLLED ON UPSTREAM RIPRAPED SLOPE.	

EMBANKMENT

ISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
UNCTION OF EMBANKMENT ND ABUTMENT, SPILLWAY ND DAM	OK	
NY NOTICEABLE SEEPAGE	NO	
TAFF GAGE AND RECORDER	YES - OPERATIONAL	
RAINS	TOE DRAIN PIPE COLLECTOR SYSTEM RUNNING SLIGHTLY IN MANHOLE	PIPE WEIR TO MONITOR FLOW

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATION
CONCRETE WEIR	OK	
APPROACH CHANNEL	NONE	
DISCHARGE CHANNEL	CLEAR AND OPEN - MINOR BANK SLOUGHING	
BRIDGE AND PIERS	WELL MAINTAINED - SHOWED NO SIGNS OF DISTRESS	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	GOOD CONDITION	
APPROACH CHANNEL	NONE	
DISCHARGE CHANNEL	OK	
BRIDGE AND PIERS	OK	
GATES AND OPERATION EQUIPMENT	RIGHT BASCULE GATE LOCKED IN UPRIGHT POSITION - HYDRAULIC SYSTEM BEING REPAIRED	OK

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIO
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	NONE - HOWELL BUNGER U.: YES LEAKING SLIGHTLY	OK
INTAKE STRUCTURE	OK	
OUTLET STRUCTURE	OK	
OUTLET CHANNEL	OK	
EMERGENCY GATE		

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDA
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	NONE - MINOR BANK SLOUGHING NOTED	
SLOPES	NOTED ABOVE	
APPROXIMATE NO. OF HOMES AND POPULATION	HAZARD CATEGORY	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIO
MONUMENTATION/SURVEYS	NONE; EXCEPT SURVEILLANCE PATROL PERIODICALLY	
OBSERVATION WELLS	NONE	
WEIRS	YES - AS PER PLANS	
PIEZOMETERS	NONE	
OTHER	ELECTRONIC SURVEILLANCE FOR TRESPASS AND "DOOR BUGS" TO BE INSTALLED AT SOME FUTURE DATE.	

RESERVOIR

ISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIO!
LOPES	OK	
EDIMENTATION	NONE OBSERVED	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Lake de Forest DAM

ID # 95

ITEM	REMARKS
AS-BUILT DRAWINGS	NONE AVAILABLE
REGIONAL VICINITY MAP	AVAILABLE FROM PLANS
CONSTRUCTION HISTORY	AVAILABLE FROM [redacted] BUCK, SEIFERT AND JOST
TYPICAL SECTIONS OF DAM	AVAILABLE FROM PLANS
OUTLETS - PLAN - DETAILS -CONSTRAINTS -DISCHARGE RATINGS	FROM PLANS
RAIN &/RESERVOIR RECORDS	RECORDS ARE AVAILABLE FROM [redacted] SPRING VALLEY WATER WORKS AND SUPPLY C[redacted]

REMARKS

DESIGN REPORTS

AVAILABLE AT DISTRICT FILE

GEOLOGY REPORTS

HAVE COPY

DESIGN COMPUTATIONS — PARTIALLY AVAILABLE
HYDROLOGY & HYDRAULICS - HAVE BEEN DEVELOPED
DAM STABILITY - PARTIALLY AVAILABLE
SEEPAGE STUDIES - NONE

MATERIALS INVESTIGATIONS
BORING RECORDS
LABORATORY
FIELD

HAVE COPY

POST-CONSTRUCTION SURVEYS OF DAM

NONE AVAILABLE

BORROW SOURCES.

ON SITE

ITEM	REMARKS
MONITORING SYSTEMS	REGULAR PATROLLED SURVEILLANCE
MODIFICATIONS	NONE
HIGH POOL RECORDS	AVAILABLE (INCLUDED IN REPORT)
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE AVAILABLE
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	NONE
MAINTENANCE OPERATION RECORDS	AVAILABLE FROM SPRING VALLEY WATER WORKS

REMARKS

SPILLWAY PLAN

SECTIONS

DETAILS

> FROM PLANS

OPERATING EQUIPMENT PLANS & DETAILS - FROM PLANS

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 26.6 SQ. MILES

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 85' - 17,250 ACRE-FT

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 85 - 17,250 ACRE-FT

ELEVATION MAXIMUM DESIGN POOL: 90'

ELEVATION TOP DAM: 100'

CREST:

a. Elevation 80' (GATES DOWN) 85' (GATES UP)
b. Type REINFORCED CONCRETE SPILLWAY
c. Width
d. Length WEIR LENGTH - 100 FT
e. Location Spillover LEFT END OF DAM
f. Number and Type of Gates TWO 50' BASCULE GATES

OUTLET WORKS:

a. Type 2 HOWELL - BUNGER VALVED CONDUITS
b. Location WEST CONTROL STRUCTURE
c. Entrance inverts 3 SLUICE GATES ELEVATIONS 60', 67.5', 75'
d. Exit inverts 2 VALVES AT ELEVATION 58'
e. Emergency draindown facilities 24" VALVE AND 12" VALVE

HYDROMETEOROLOGICAL GAGES:

a. Type USGS STREAM GAGE - (NEAREST RAIN GAGE AT SUFFERN
b. Location 1 MILE DOWNSTREAM AT WEST NYACK
c. Records AVAILABLE

MAXIMUM NON-DAMAGING DISCHARGE: 80-85 MGD


DATE
FILMED
-8